AWARD WINNING!

FLYING SQUIRREL + KICKBOXING DINO + ELECTRIC SUPERCAR + AN UNDERSEA OASIS

TOY STORIES

The tech that makes your toys tick p24

THE WEEK Junior

HEROES OF SCIENCE

Meet a danger-loving animal expert p20

FREE! 2 HUGE POSTERS

MOON MISSION!
CREATURE CALENDAR!

Science+Nature

MAKING SENSE OF THE UNIVERSE

CHRISTMAS 2022 · ISSUE 56

CHILL OUT!

Journey to the South Pole and find out about life on the ice p12

PLUS!

Explore the mystery of a mountain monster p28

VISIT…

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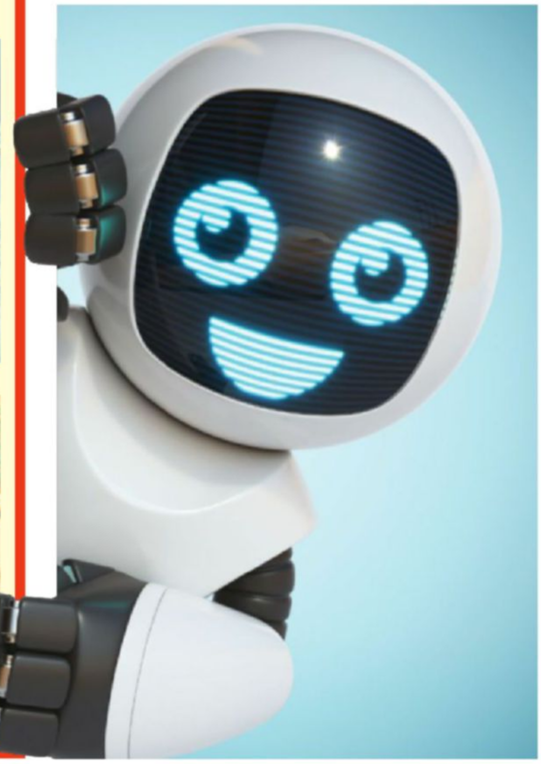

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How well do you know this month's issue?

Wrap up warm! We're off to the frozen wastes of Antarctica. I am really excited, since I so desperately want to visit this ice-locked continent at the southern end of the world. Yes, it's remote and hostile but Antarctica holds many secrets that could be the key to understanding how our planet works. Locked up in the ice is a one-of-a-kind record of the past climates of Earth that stretches back over one million years.

This pristine winter wonderland is a wild and beautiful environment. The world's highest, driest, windiest and coldest continent is home to amazing wildlife. It's also a massive science laboratory. As the polar research ship RRS Sir David Attenborough set off from the UK on its second voyage to Antarctica, *The Week Junior Science+Nature* caught up with the crew to talk about the important work that they will do near the South Pole. You can find out all about it on page 12.

I was also excited that we got the chance to chat with Steve Backshall. The animal expert and star of the TV show *Deadly 60* is a daredevil – and one of my personal heroes of science. I loved hearing of his terrifying brush with a hungry hippo (page 20). If animals are your thing, don't miss the story (page 11) of the peculiar primate caught picking its nose… and licking it. Yuck!

Let me finish with a massive thank you to all our superstar readers. Your brilliant pictures, intriguing questions and interesting insights are what we do this for. As a little Christmas present, we've put together a colourful pull-out 2023 calendar that you can find in the middle of the magazine. As well as looking awesome on your wall, it's got all the *Science+Nature* release dates marked on it, so you won't miss a single issue!

Have a merry Christmas and stay curious!

Dan Green, editor

Science+Nature

BSME Launch of the Year 2019

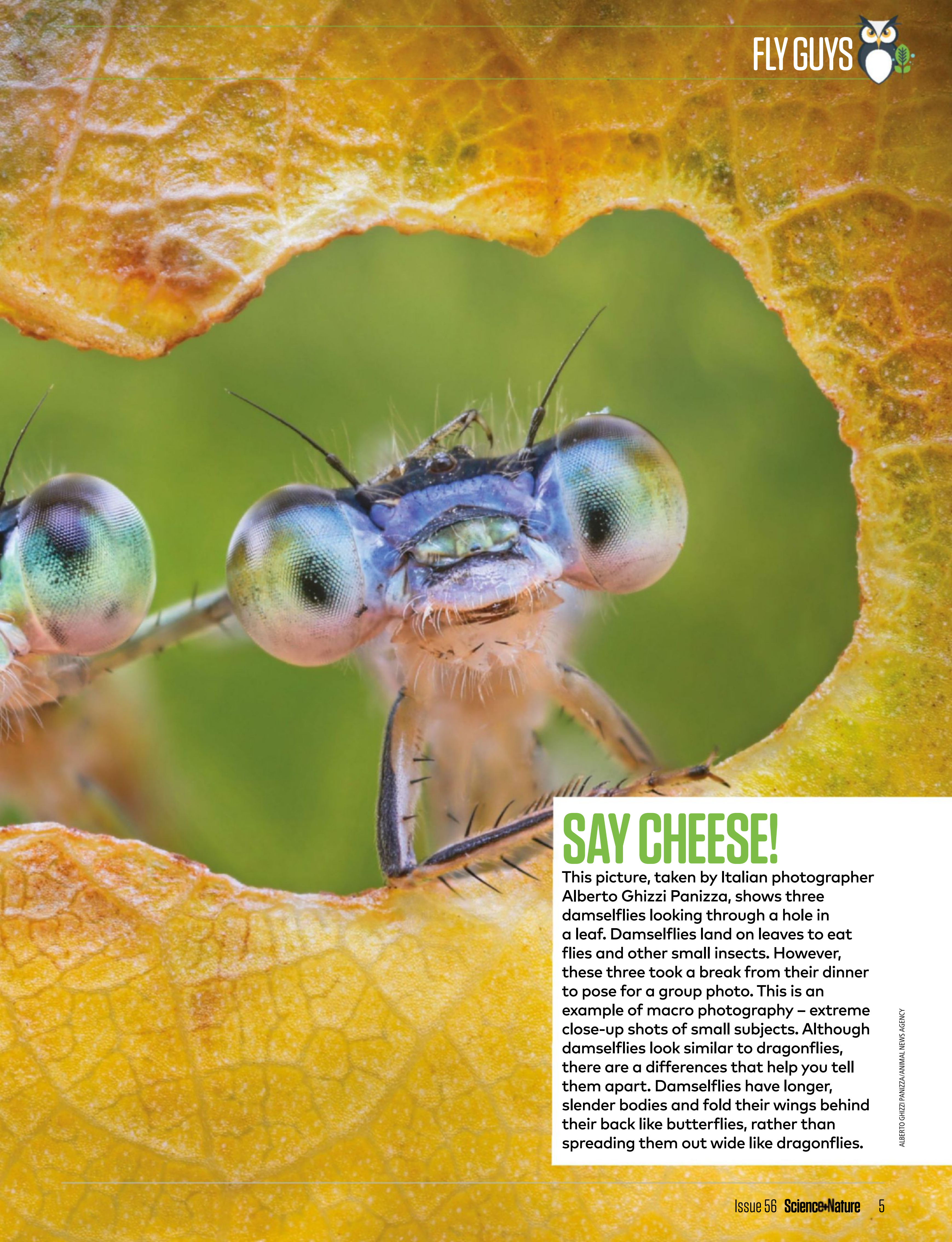
MAKING SENSE OF THE UNIVERSE

Science+Nature is brought to you by the award-winning team behind *The Week Junior*. Every issue includes fascinating features written by experts, accompanied by fabulous images. This issue's explainers are writer Isabel Thomas, who guides us through the frozen continent of Antarctica (page 12); expert explainer Ciaran Sneddon writes about the tech behind your favourite toys (page 24); wildlife presenter Jess French reveals this month's nature highlights (page 22); Adam Stoner investigates the mystery of a mountain monster (page 28); technology writer Tom Jackson takes a look at the Rolls-Royce Spectre (page 32); and the Royal Institution's Peter Gallivan answers your trickiest science questions (page 42).

Readers who subscribe to both *The Week Junior Science+Nature* and *The Week Junior* now receive their copies in a paper envelope instead of a polywrap. This is part of our commitment to reduce plastic waste. Please reuse the envelope or dispose of it responsibly by recycling.

ON THE COVER: REX SHUTTERSTOCK · SPINMASTER.
ON THIS PAGE: GETTY IMAGES · NASA · REX SHUTTERSTOCK

ANCIENT FLIERS
Damselflies have existed on Earth for more than 300 million years.



ALBERTO GHIZZI PANIZZA/ANIMAL NEWS AGENCY

SAY CHEESE!

This picture, taken by Italian photographer Alberto Ghizzi Panizza, shows three damselflies looking through a hole in a leaf. Damselflies land on leaves to eat flies and other small insects. However, these three took a break from their dinner to pose for a group photo. This is an example of macro photography – extreme close-up shots of small subjects. Although damselflies look similar to dragonflies, there are a differences that help you tell them apart. Damselflies have longer, slender bodies and fold their wings behind their back like butterflies, rather than spreading them out wide like dragonflies.

That's amazing!

The best discoveries, inventions and surprises

Meteorites helped form Earth's oceans

The mystery of where Earth's water came from may have been solved.

On 28 February 2021, a chunk of space rock blazed through the sky above the UK, creating a flash of bright light and a loud sonic boom. It dropped onto a driveway in the town of Winchcombe in Gloucestershire, England. Cameras dotted across Britain as part of UK Fireball Alliance (UKFAll) tracked the meteorite's flight, allowing scientists to determine where in the solar system it came from, and predict where it fell. A team from the Natural History Museum in London hurried to the town to retrieve it. Now, after almost two years of research, they have revealed its astonishing secrets.

The chunks of space rock contain water that is a near-match for the water found here on Earth. This adds confidence to a long-standing theory that meteorites brought water and other key chemicals to this planet. When Earth formed around 4.5 billion years ago, it was too hot for water to remain at the surface, and would have boiled off. So, many scientists believed that water must have been carried to Earth later on by icy comets. While the chemical makeup of comets doesn't quite match this theory, the Winchcombe meteorite may help to solve the mystery.

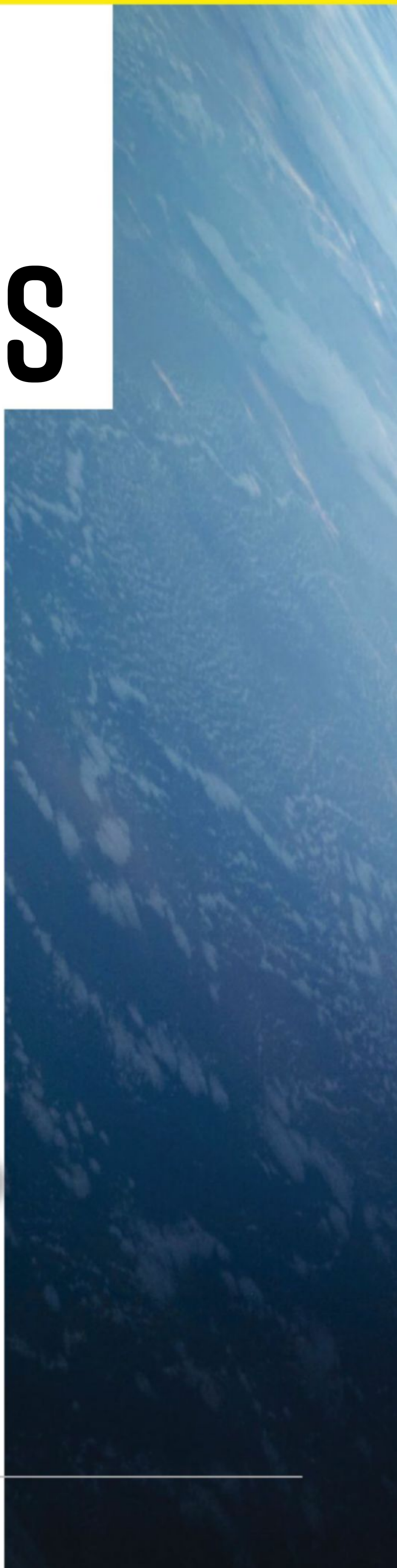
The space rock is a rare type of meteorite called a carbonaceous chondrite (say car-bon-ay-see-us kon-drite). About 11% of its weight was water, and the mix of atoms in the water almost perfectly matches the water found on Earth. The rock also contains other substances that may have helped life get started on this planet. Because it was collected within 12 hours after falling from space, the meteorite wasn't contaminated with Earth water.

Dr Ashley King from the Natural History Museum, an author of the study, said that the speed with which the Winchcombe space rock was picked up means that it is unspoiled. "Bar fetching rock samples back from an asteroid with a spacecraft, we could not have a more pristine specimen," he said. This means that the compositions measured are just the same as they were at the beginning of the solar system, 4.6 billion years ago.

Scientists also think they know where the Winchcombe fragment came from. Based on the angle at which it fell, the meteorite probably originated somewhere in the asteroid belt between Mars and Jupiter. It would have taken between 200,000 and 300,000 years to get here. Now that's a long journey.

TOO HOT TO HANDLE

When Earth first formed, it is thought that temperatures reached as high as 7,358°C.



Christmas Eve meteorite

'Twas the night before Christmas in 1965. People in Barwell, a village in Leicestershire, England, were getting excited for the next day, wrapping presents and preparing food. At around 4.20 pm, something bright shot through the sky. Shortly after, people heard a boom. It was a 4.5-billion-year-old meteorite about the size of a turkey. Fragments of the meteorite were discovered on Christmas Day, allowing scientists to study it. The Barwell meteorite is one of the largest recorded meteorite falls in British history. You can see chunks of the space rock on display at the National Space Centre in Leicester.

The Barwell meteorite.

ALAMY · GETTY IMAGES · REX SHUTTERSTOCK

Meteorites can travel through space for thousands of years.

The Winchcombe meteorite.

"Living legend" wins Tree of the Year

The Tree of the Year.

TREE AS OLD AS TIME

At 3,000 years old, the Fortingall yew in Scotland is thought to be the oldest tree in Britain.

A yew at Waverley Abbey in Surrey, England, has been named the UK's Tree of the Year. The Tree of the Year is an annual competition run by the Woodland Trust – the UK's largest woodland conservation charity – and aims to highlight how vital trees are for the landscape and people's lives.

Members of the public are invited to submit trees for the award and then vote for the winner. The yew came out on top with 16% of the vote. With sprawling roots above and below the ground, this tree is dotted with holes and crevices in its trunk, which provides valuable habitat for wildlife.

Tom Reed, a citizen science officer at the Woodland Trust's Ancient Tree Inventory, said "The way the tree is rooted within the ruins of the abbey is a great symbol of the fact that our ancient trees are intertwined with other aspects of our cultural heritage." The exact age of the tree is unknown but it's thought to be around 500 years old.

The Woodland Trust wants yew trees, which are among the oldest in the UK, to receive the same protections as historic buildings. Reed said, "We're calling for greater protection for these living legends."

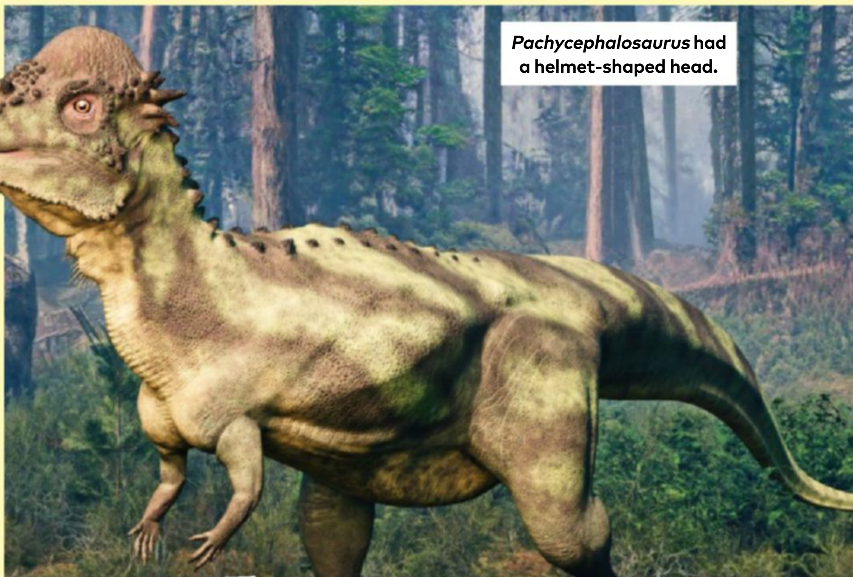
In second place, with 11% of the vote, was the Portal Tree Rowan in Midlothian, Scotland. Its name comes from the shape of the tree, which looks like a portal to another world. The Waverley Abbey yew will now go on to represent the UK in the European Tree of the Year competition in 2023.

The dinosaurs that kicked like kangaroos

Experts have discovered that a species of dinosaur might have kickboxed like kangaroos, instead of headbutting each other, as previously thought. *Pachycephalosaurus* (say pack-ee-sef-al-oh-sor-rus) was a herbivore (plant-eater) that lived during the late Cretaceous Period, between 76–65 million years ago. They had dome-shaped skulls, which led experts to believe they butted heads, like rams. However, a new study has revealed that they may have been kickboxing champs instead.

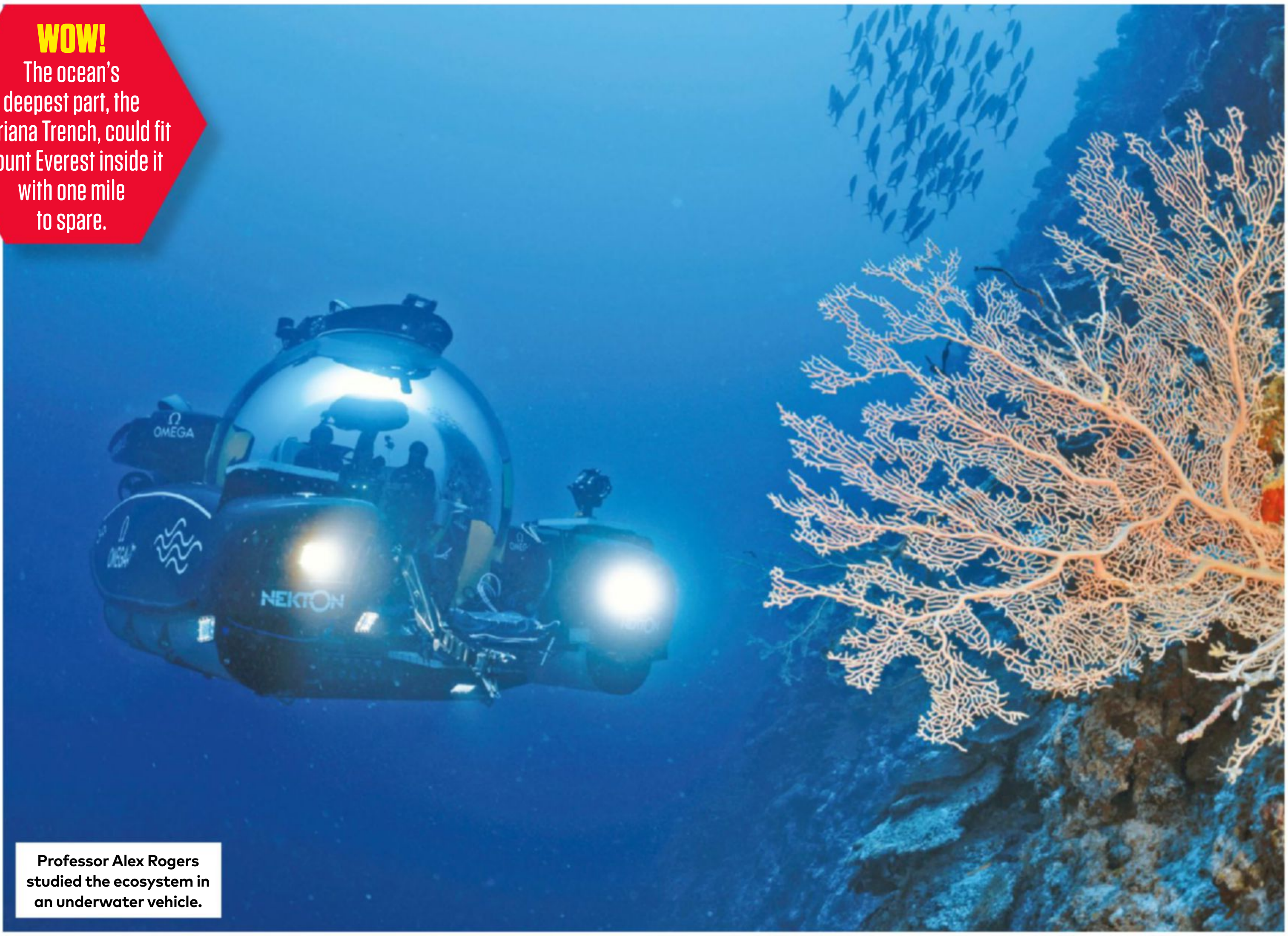
Palaeontologists (scientists who study fossils) made a virtual 3D model of a preserved *Pachycephalosaurus* skeleton and noticed how similar its body shape was to a modern kangaroo. Lead researcher Cary Woodruff, from Frost Museum of Science in Miami, US, said, "The skeleton in our study supports that they used their tail as a prop like kangaroos do, but not that they ran at each other and bashed their heads together." The dino probably used its tail as an extra leg, to keep itself upright as it thrust its legs outwards.

While these dinosaurs may have butted heads, Woodruff says it's unlikely they did so at high speeds. He thinks there are too many differences between them and other ramming animals.



Pachycephalosaurus had a helmet-shaped head.

Kick-boxing kangaroos.



WOW! The ocean's deepest part, the Mariana Trench, could fit Mount Everest inside it with one mile to spare.

Professor Alex Rogers studied the ecosystem in an underwater vehicle.

New "oasis of life" found underwater

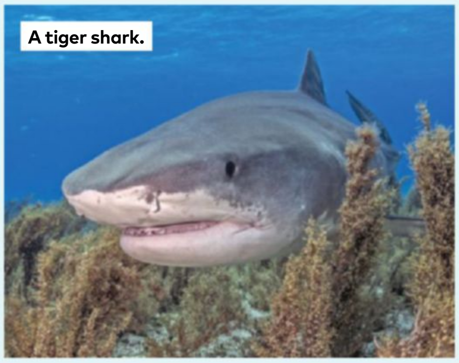
A new ecosystem has been discovered 500 metres under the surface of the Indian Ocean. An ecosystem is a community of living things. The discovery was made by the Nekton Maldives Mission, a survey of ocean life in the Maldives, which includes scientists from the University of Oxford in the UK.

The new ecosystem, which has been called "The Trapping Zone", is home to a number of sharks and other large fish feeding on micro-nekton. Micro-nekton are small swimming organisms that can move against ocean currents, unlike plankton. They travel up to the surface of the ocean at night and back down into the deep during the day. However, the steep undersea cliffs at this newly discovered spot, stop creatures from diving deeper once the Sun has risen. This trapping effect creates a plentiful food source, attracting a wide number of larger sea creatures to feast at the underwater canteen – including tuna, spiky oreo, alfonsino and lots of different sharks.

Professor Alex Rogers, from the University of Oxford, spent more than 30 hours in a submersible observing this new ecosystem. "The Trapping Zone is creating an oasis of life in the Maldives and it is highly likely to exist in other oceanic islands and also on the slopes of continents," he said. Lucy Woodall, an Associate Professor of Marine Biology at the University of Oxford and a principal scientist on the Nekton Mission, said the next step is to find out why this is happening. "This will enable us to understand the deep ocean in much better terms," she added.

Sharks find undersea meadows

Scientists have found the world's largest seagrass meadow with the aid of some unlikely helpers – tiger sharks. A team of researchers attached cameras to the fins of tiger sharks, which are speedy swimmers that can dive deep underwater. This gave the scientists hours of footage and revealed the existence of a 92,000 square-kilometre seagrass meadow on the sea bed in the Bahamas. This discovery increases the global seagrass coverage by more than 40%. Seagrass is important because it helps to protect the planet by absorbing lots of carbon dioxide (a gas that traps heat).



A tiger shark.

BABELSTONE · COURTESY OF NEKTON · GETTY IMAGES · REX SHUTTERSTOCK

Scientists find nearest black hole to Earth

Astronomers have discovered a new black hole that now holds the record for the closest black hole to Earth. Named Gaia BH1, after the Gaia spacecraft that spotted it, this black hole is three times closer to Earth than the previous record holder.

Average-sized black holes are thought to form when massive stars collapse in on themselves. All of the material in the star gets compressed into a tiny space, which gives the black hole such enormous gravity that not even light can escape from it. This makes them hard to find, since they are very dark. However, scientists think that there may be thousands of black holes in the Milky Way (our galaxy).

Gaia BH1 is a dormant (not active) black hole that weighs about 10 times the mass of the Sun. It was spotted by making very careful observations of a star orbiting around it. "Take the Solar System, put a black hole where the Sun is and the Sun where the Earth is, and you get this system," explained Kareem El-Badry, the lead author of the study at the Harvard-Smithsonian Center for Astrophysics, US.

Although Gaia BH1 is the closest black hole to Earth, it's still very distant, at around 88 million billion miles away.

I SPY

The first black hole was discovered in the 1960s. Called Cygnus X-1, it is 10 times more massive than the Sun.

An artist's impression of a black hole.

A gloomy octopus.

Grumpy octos hurl shells

Octopuses have many uses for their tentacles, including helping them to swim and catch prey. However, researchers at Jervis Bay in Australia have found that one species, known as the gloomy octopus, also uses its tentacles to deliberately throw objects at other octopuses.

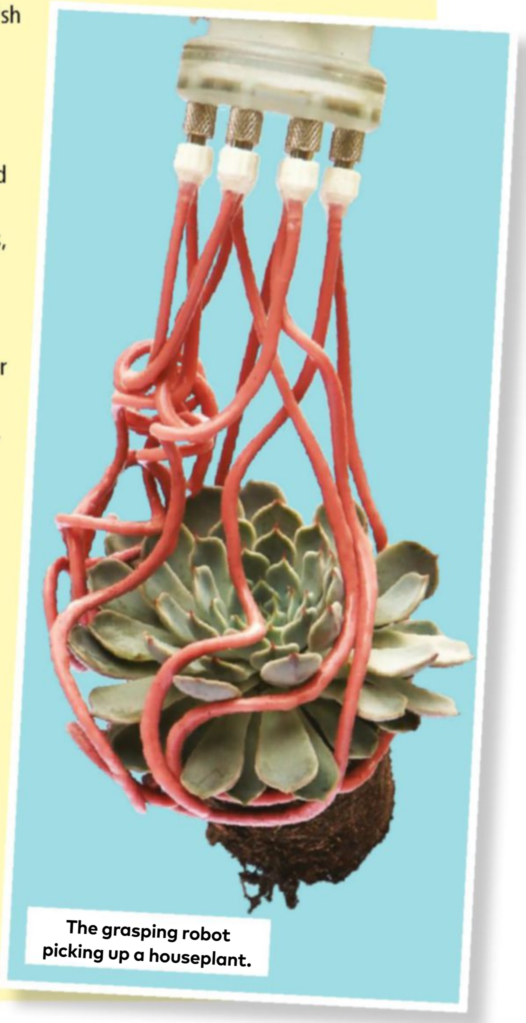
The team recorded what they called "octopus TV" on an underwater camera. During more than 20 hours of filmed footage, the grumpy octopuses were spotted using their tentacles to gather up shells, algae and silt, before hurling them at other octopuses. They then used a part of their body called a siphon to blow a jet of water and propel the objects further. It seemed that the octopuses were deliberately targeting each other. Their bodies turned a darker colour when they were throwing, which often happens when they threaten other creatures. The rival octopuses would also duck when having objects thrown at them, which suggests they expected this behaviour.

The researchers say it is hard to be sure why the octopuses throw stuff, but this kind of behaviour has only been seen in a few non-human animals.

Bots pick up new tricks

Inspired by the way that jellyfish use their tentacles to catch prey, a group of researchers have created a robot that uses thin, soft, grippy "tentacles" to pick up heavy and oddly-shaped objects. These "tentacles" are made from hollow rubber tubes, which are thicker on one side than the other. When the tubes are inflated, they curl up and become tangled with each other or the object they're picking up. The more tangled they become, the stronger their grip is. The object can be released by deflating the tubes.

The researchers tested how well the robot could pick up different objects, such as houseplants and toys. In the real world, it could be used in food production to pick up fruit and vegetables, or even in some medical procedures. Professor Robert Wood, who worked on the research project, said, "This approach expands the range of what's possible to pick up with robotic grippers."



The grasping robot picking up a houseplant.

Humans given lab-grown blood

In a world-first trial, scientists have given human volunteers blood that was grown in a lab. They're hoping that this could be used for future blood transfusions, a medical procedure that involves replacing lost blood with donated blood from other people.

It can sometimes be difficult to give people blood transfusions if there's a shortage of donated blood. There are eight main blood types in humans, which are based on people's genes (chemicals that carry all the information that determines your traits, like the colour of your hair and eyes).

It's dangerous if people aren't given the correct blood type, so creating lab-grown blood could ensure that all blood types are always available.

To produce the blood, researchers began with a donation of human blood. They used magnetic beads to separate stem cells (special cells in your body with the ability to become any other type of cell) from the rest of the blood. Large numbers of stem cells were grown into red blood cells. The two patients in the trial were only given a couple of teaspoonfuls of the lab-grown blood to see how it performed inside the body.

An illustration of red blood cells in a blood vessel.

LIFE SAVERS

The NHS needs around 135,000 new donors every year to meet patient demand for blood.

HARVARD MICROROBOTICS LAB/HARVARD · REX SHUTTERSTOCK · NIKI HUBBARD

The aye-aye is an odd-looking fellow.

Lemur experts dig deep

On the island of Madagascar, in Africa, there is a type of lemur called an aye-aye, with large eyes, a bushy tail and an unusually long middle finger. Scientists have just discovered that the little lemur likes to use it to pick its nose.

Researchers already knew that the aye-aye uses its long, skinny finger to tap on tree bark. It locates hiding grubs and winkles them out to eat. However, while studying a video recording, Dr Anne-Claire Fabre was shocked to see an aye-aye insert its middle finger all the way into its nose, pull it out and lick off the mucus. "I was really surprised," Fabre said. "To fit the entirety of its third finger into its nose is pretty impressive! I was trying to imagine where it was going." An aye-aye's finger can reach up to eight centimetres long.

Scientists created a 3D model of the aye-aye's head using X-ray scans, and found that the finger is digging all the way to the back of the aye-aye's throat through its nostril. No one is sure why these creatures like to pick their nose. It could be a way to clean themselves, or it could be because they like the taste of their own snot. One thing's for sure, though, this strange creature keeps getting stranger still.

CHEERS, BIG EARS!

An aye-aye's enormous ears are the largest compared to body size of any primate.

CHILL OUT!

Journey to the South Pole to find pooing penguins, frozen fossils and trailblazing scientists.

Grab a coat or five and get ready to explore Earth's coldest continent. Antarctica is in the southern hemisphere, so you're arriving in the middle of its summer. The bad news? Summer at the South Pole is no warmer than a typical freezer.

Antarctica is nearly twice the size of Australia but its frosty climate means that most of this giant continent is covered by a thick layer of ice. The Antarctic ice sheet is basically the world's biggest ice cube, locking away 60% of all Earth's fresh water. This dazzling white polar cap reflects more than half of the sunlight that hits it, helping to keep average temperatures between -10°C and -60°C.

Thanks to its bitterly cold climate, hurricane-force winds and dark winters, this frozen southern continent has no trees or bushes, no towns or cities and no permanent human population – but it's not empty. Wildlife flourishes around its edges, both above and below the ice. From whopping whales to tiny tardigrades, Antarctica's extremophiles (organisms with the ability to thrive in extreme environments) are well adapted to life in the world's biggest freezer. Every summer they are joined by more than 4,000 scientists, who live and work on Antarctic during the warmer months. Let's join them to uncover some strange secrets about our planet – and the universe beyond!

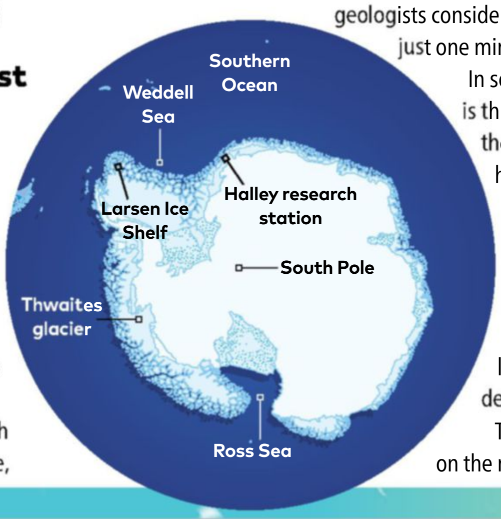
The world's most hostile land

Unlike the Arctic (an ice-covered ocean surrounded by land) Antarctica is solid rock, topped with ice and surrounded by ocean. At 14.2 million square kilometres it's the world's fifth-largest continent.

The South Pole is much colder than the North Pole, with winds that whip across the ice at 200 miles per hour. Antarctica is so dry it's officially a desert. Temperatures plunge as low as -89.2°C, and any snow that falls never melts. Antarctica's mountains, lakes and canyons are buried under 35 million years of snowfall, squeezed into ice so hard that geologists consider it a type of rock, made of just one mineral.

In some places the ice sheet is three miles thick, rivalling the height of Europe's highest mountains. This frozen frosting covers over and conceals mountain ranges, volcanoes, fast-flowing rivers, city-sized lakes and the world's deepest canyon.

The ice itself is constantly on the move, flowing slowly



BIG BIRD

Emperor penguins are the biggest of all the 18 species of penguin, and one of the world's largest birds.

The Larsen Ice Shelf.

WOW! One of the largest-ever icebergs broke off the Larsen Ice Shelf in 2017. Known as A-68, it was hundreds of metres thick, with an area larger than Norfolk.

RRS Sir David Attenborough breaks the ice

A humpback whale feeding.

towards the Southern Ocean as glaciers. As they reach the sea, giant shelves of ice push out into the water. Two of these floating ice shelves are bigger than the British Isles. The ice slowly melts into the warmer seawater, but is constantly replaced by the glacier sliding off the land. Huge chunks break off from the nose of the glacier, "calving" giant icebergs that crash into the ocean.

Deadly journeys

The impenetrable sea ice, ship-sinking icebergs and hurricane-force winds have not put people off trying to explore Antarctica. The ancient Greeks predicted that there must be something at the southernmost end of the world, but European sailors didn't spot Antarctica's frozen shores until 1820.

However, there are clues that people visited Antarctica long before this. Stories and art from the islands of the Pacific Ocean tell of Polynesian explorers who visited the icy continent at least 1,300 years ago (during Britain's Anglo-Saxon period).

An iceberg in Antarctica.

Even after Antarctica was added to maps, exploring the continent proved challenging. Over the last 200 years, thousands of people have battled their way to its coast and tried to cross its bleak, frozen landscape to reach the geographic South Pole.

Norwegian explorer Roald Amundsen was the first to complete the journey in December 1911, followed 33 days later by British explorer Robert Falcon Scott. The journey across the frozen wilderness has claimed hundreds of lives, including Scott and his team, who died from exhaustion, cold and hunger on their way back.

This month, the research ship RRS Sir David Attenborough set sail from the UK with a 30-strong crew and around 60 scientists on its second mission to explore the Antarctic.

Antarctic wildlife

Although humans struggle to survive in Antarctica, plenty of animals have adapted to thrive in the planet's chilliest zone. Most Antarctic animals live around the coast, where they can spend all or part of their lives in the relatively warm ocean. That's not to say you should take a dip. Under the sea ice, the ocean can be almost two degrees colder than freezing. The salt in the water stops it from becoming solid ice by lowering its freezing point.

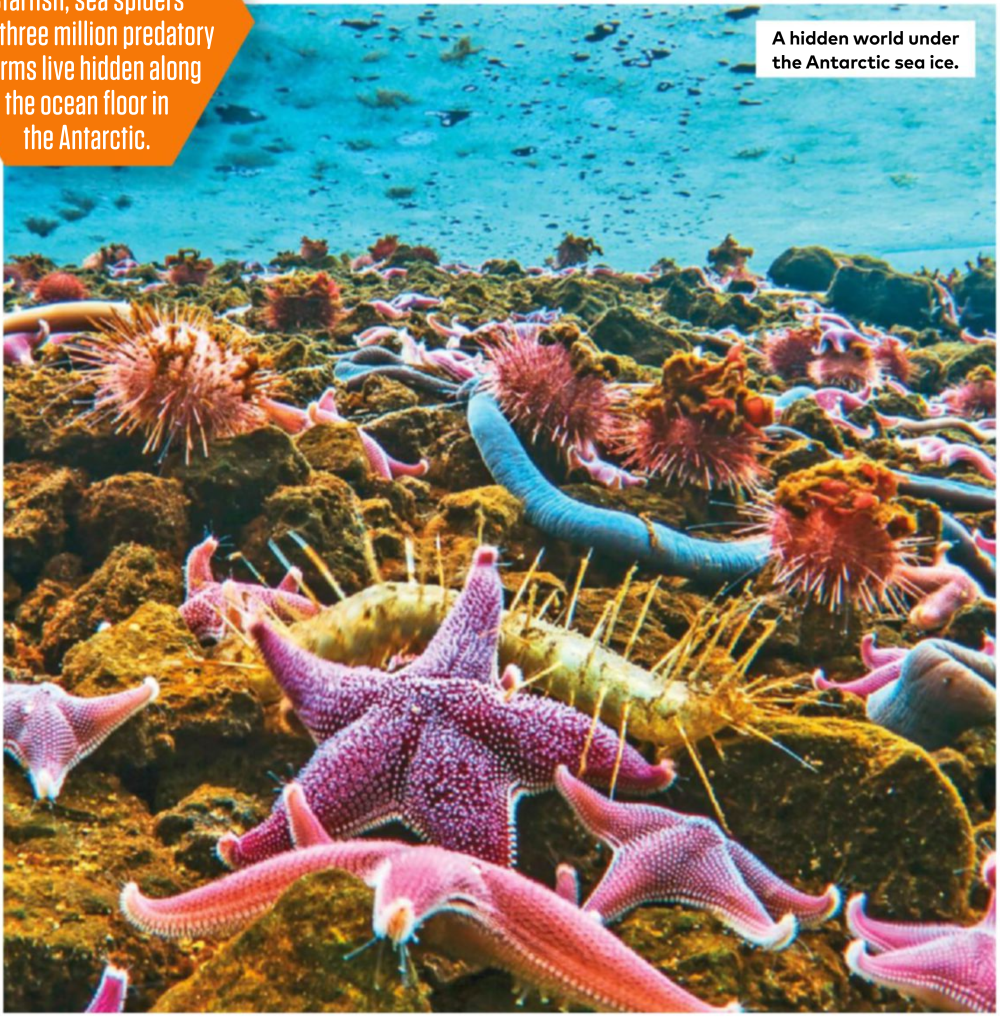
Most fish wouldn't survive, but icefish do thanks to their special clear blood, which contains antifreeze to stop it from freezing solid. A cluster of millions of icefish nests was recently spotted under the Weddell Sea, showing scientists that these creatures are a key part of the Antarctic food chain.

Robotic submersibles have been sent to explore the cold, dark Antarctic sea floor, expecting to find very little. Instead they found it carpeted with all kinds of bizarre bottom-dwellers, from giant sea spiders to toxic, two-metre ribbon worms that team up to eat anything they come across. The Ross Sea region covers 1.55 million square kilometres and has been declared a Marine Protected Area (MPA), to limit or ban activities such as fishing. There are plans to establish more MPAs in the Southern Ocean to protect this spectacular sea life.

The most abundant Antarctic sea creatures are the small crustaceans known as krill. Seabirds such as penguins, albatrosses and skuas, and marine mammals such as whales, orcas and seals, come to the Southern Ocean to feast on the five species of krill. Humpback whales can eat up to a third of their own body weight in krill every day.

DID YOU KNOW?

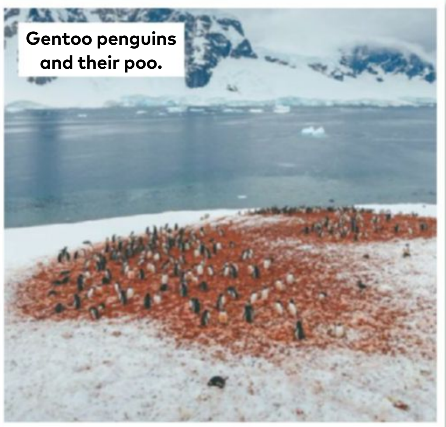
Starfish, sea spiders and three million predatory worms live hidden along the ocean floor in the Antarctic.



A hidden world under the Antarctic sea ice.

THAT'S DISGUSTING

Imagine a pile of poo so big it's visible from space. Satellites are being used to spot new penguin colonies in Antarctica, by looking out for large patches of poo. The red-brown guano (another word for bird poo) shows up well against the bright ice, helping scientists to find new penguin colonies. Studying the size of colonies and where they form is important for understanding the effects of climate change on the world's southernmost landmass. Penguins spend most of their lives on sea ice, which means they are very vulnerable to warming temperatures.



Gentoo penguins and their poo.

Winter endurance

Most of Antarctica's birds and marine mammals are summer visitors. Emperor penguins and Weddell seals are the only large animals to stay in Antarctica year-round, huddling near the coast so they can hunt for food (and warm up) in the sea.

At least 400,000 emperor penguins live in Antarctica, gathered together in huge colonies. Standing up to 1.2 metres tall, emperor penguins are some of the largest birds, and the toughest. They breed at the coldest, darkest time of year so their chicks will hatch out in warmer weather. This means keeping eggs warm in -50°C temperatures and 100 mile-per-hour winds. Male emperor penguins take on this task, balancing a single egg on their feet. Dense feathers and lots of body fat help to keep the precious eggs up to 70°C warmer than the air. The penguins huddle together for warmth, taking it in turns to shelter from the cold.

Emperor penguins can cope with three months without a sunrise, but plants need water and light all year round. You won't spot trees and shrubs in this frozen desert. However, some mosses, liverworts and grasses do survive. They provide habitats for several microscopic animals, including tardigrades (also known as "water bears"). Like moss itself, tardigrades can hibernate for many years without water, and survive temperatures even lower than Antarctica's.

Although the frozen south has fewer plants and animals than other continents, it is not short of microbes. In liquid lakes hundreds of metres below the Antarctic ice sheet, each millilitre of water may contain tens of thousands of bacteria. They survive by feeding on chemicals released from crushed rocks. In the world's saltiest pond, the Don Juan Pond, scientists have found evidence of microbes living in the sludge at the bottom.

Fungi such as *Penicillium* mould have been found living in glacial ice. Acid-loving bacteria even thrive in the permanently frozen soils of the snow-free McMurdo Dry Valleys – habitats so hostile they remind scientists of Mars. Scientists are keen to learn more about how these microbes cope in such extreme conditions.

A researcher ice climbing in the Antarctic.

Human visitors

Along with the whales, seabirds and seals, Antarctica has another set of seasonal visitors – up to 4,000 scientists who live and work on the continent over the summer months. They stay at 70 bases known as research stations. Together they study every aspect of this amazing ice-locked land, from the rocky landscapes deep beneath the icecap, to the atmosphere high above it.

One of the most famous research stations is the British Antarctic Survey's Halley VI, which rests on an ice shelf at the edge of the continent. The ice feels solid, but it is actually flowing towards the sea at up to three kilometres per year. To cope with this shifting foundations, Halley VI is built in modules that sit on tall legs. This stops the base being buried in snow or crushed by ice. The legs sit on huge skis so Halley VI can be towed to a new location if the ice begins to crack.

Although Antarctic expeditions are safer than they once were, today's polar scientists still face harsh conditions. November, December and January are the warmest months, but during this time the Sun never sets. Windows have thick blinds to block out the midnight Sun.

A typical research station might host specialists in rocks, glaciers, animals, microbes, oceans, space, weather and physics – each working on their own

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Halley research station with the stunning southern lights in the sky above.

FROZEN FACES

Scientists visiting Halley VI get special training on dressing safely. Even so, the water in their breath freezes on their faces!

research projects – as well as support staff such as chefs, engineers and doctors.

Working days are long, to get as much done as possible. On rare days off, scientists explore nearby landscapes, skiing, ice climbing or skijoring (being pulled along on skis by a dog) if the weather is good enough. They can also visit their nearest neighbours, the emperor penguin colony at Windy Bay, 20 miles away. It's important not to get too close. An international treaty forbids interfering in any way with a penguin or its eggs.

In winter, the weather is too bad for boats and planes to reach the research stations to drop off supplies, so most scientists return home at the end of summer. However, up to 1,000 people stay behind to keep the research stations active.

A time machine to the past

Antarctica offers exciting opportunities to look back in time. By drilling deep into the ice sheet, scientists can get their hands on prehistoric ice, which contains bubbles of ancient air, trapped during snowfalls. Testing this air reveals which gases were in the atmosphere hundreds of thousands of years ago, and what the climate was like. Ice cores have become one of the most important tools for understanding climate change (long-term changes in the world's weather, including rising temperatures, caused by human activities).

Newly-discovered groundwater trapped under the ice sheet could also be thousands of years old. This "fossil seawater" may contain mysterious microbes that have evolved apart from the rest of Earth's life for millions of years.

Ice cores teach scientists more about the climate.

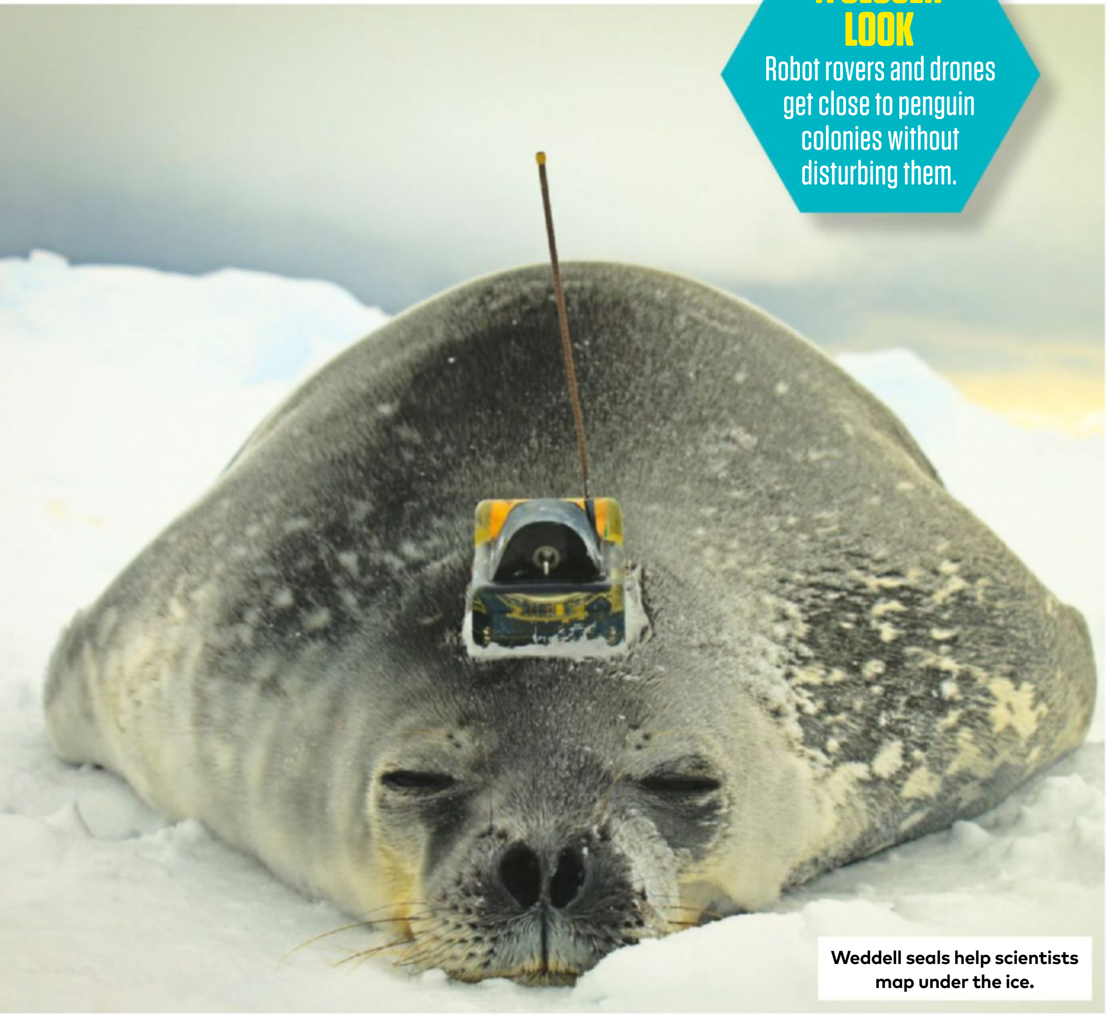
Space science on ice

Satellites also study Antarctica from space. From this higher vantage point, it is possible to measure the thickness of sea ice, to monitor how fast glaciers are flowing (and melting), to count seals and to catch illegal fishing vessels. Scientists are also watching space from the land. The dry, deserted region offers astronomers great views of the sky, without any light pollution from towns and cities drowning out the faint light from stars and galaxies. The South Pole Telescope, located at the Amundsen-Scott South Pole Station, can detect light that has travelled for billions of years to reach Earth. This helps scientists find out more about the very beginnings of the universe when the first stars were forming.

Antarctica is also home to a special kind of telescope that detects cosmic particles slamming into Earth's surface. The IceCube Neutrino Observatory has detected rare particles that weigh just two billion-billion-billion-billionths of a gram, travelling with more energy than it is possible to generate in any particle accelerator on Earth.

Cosmic particles aren't the only things raining down on Antarctica. It's a brilliant place to look for fallen space rocks, which are easy to spot on the bright ice. Around 45,000 meteorites have been collected from the continent so far, and it's thought there are hundreds of thousands more. Geologists also collect micrometeorites – tiny specks of space dust that stay intact in Antarctica's ice. Studying space rocks and dust is helping them learn more about the origins of the solar system.

Antarctica is a useful training ground for exploring other worlds, too. Robot rovers have been tested on the ice before being deployed into the extremely cold and dry conditions on Mars. Boring through thick ice to sample the rock or water beneath is good practice



Weddell seals help scientists map under the ice.

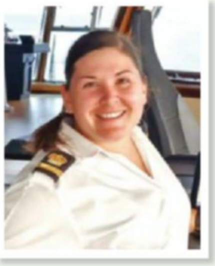
A CLOSER LOOK

Robot rovers and drones get close to penguin colonies without disturbing them.

Meet an explorer

BETH WILKINSON

AS RRS SIR DAVID ATTENBOROUGH SET OUT FOR ANTARCTICA, SCIENCE+NATURE TALKED TO THE SHIP'S 3RD OFFICER.



What do you like about being on ship?
This is my first time south to Antarctica. I hold a navigational watch twice a day, and look after all the life-saving and firefighting equipment on board. I enjoy working with a brilliant team that works together to overcome challenges we face, and the fact that every day there is something to learn.

What's the hardest part of your trip?
It's sometimes hard being away from family. However, we have an amazing team, which becomes like a second family.

What are you looking forward to?
I'm looking forward to learning more about navigating through ice.

What's one item you've packed that you can't live without?
It's hard to pick just one, but it's probably my lucky mascot – a teddy octopus called Octo!

for drilling missions to other planets and moons. This year, NASA tracked two British explorers – Justin Packshaw and Jamie Facer Childs –as they walked, skied and kite-surfed 2,270 miles across the frozen continent. By monitoring how their bodies coped with the extreme cold, NASA can learn how to keep astronauts safe on Mars.

A changing continent

By comparing today's wildlife, weather and ice with data from early scientific expeditions scientists can find out how Antarctica has changed. They have noticed, for example, that moss and microbes have been growing faster on sub-Antarctic islands in the last 50 years. Using ice cores and fossils, scientists can look back even further.

The continent is changing quickly – and there is plenty of evidence that global warming is the cause. Satellite observations show that ice sheets are melting much faster than they have in the past, and more quickly than they can be replaced by frost and snowfall. In March this year, the southern region experienced a record heatwave, with temperatures soaring nearly 40°C above the expected temperature for that time of year. Melting sea ice is having a devastating impact on animals such as penguins, which rely on ice rafts and ice shelves to rest and to breed. In October this year, emperor penguins were listed as endangered species for the first time.

As glacial ice melts faster, Antarctica's great ice shelves are also shrinking. Scientists fear that some may collapse into the sea and melt away altogether. The Thwaites glacier is one of the largest – and most unstable – glaciers in Antarctica. It is melting faster than it has done for the last 5,500 years, and its monster ice shelf could potentially collapse in the next five years.

The continent at the southern tip of Earth is so vast that changes to its ice sheet affect the entire planet. Unlike floating sea ice, which is already part of the ocean, melting glaciers and ice sheets add water to the oceans. Melting Antarctic ice has already increased the global sea level by 7.6 millimetres in the last 20 years. If the whole Thwaites glacier were to melt into the sea, it sea levels around the world would lift by 65 centimetres. This would be enough to flood parts of Hull, Peterborough and London in the UK, and hundreds of other towns and cities around the world.

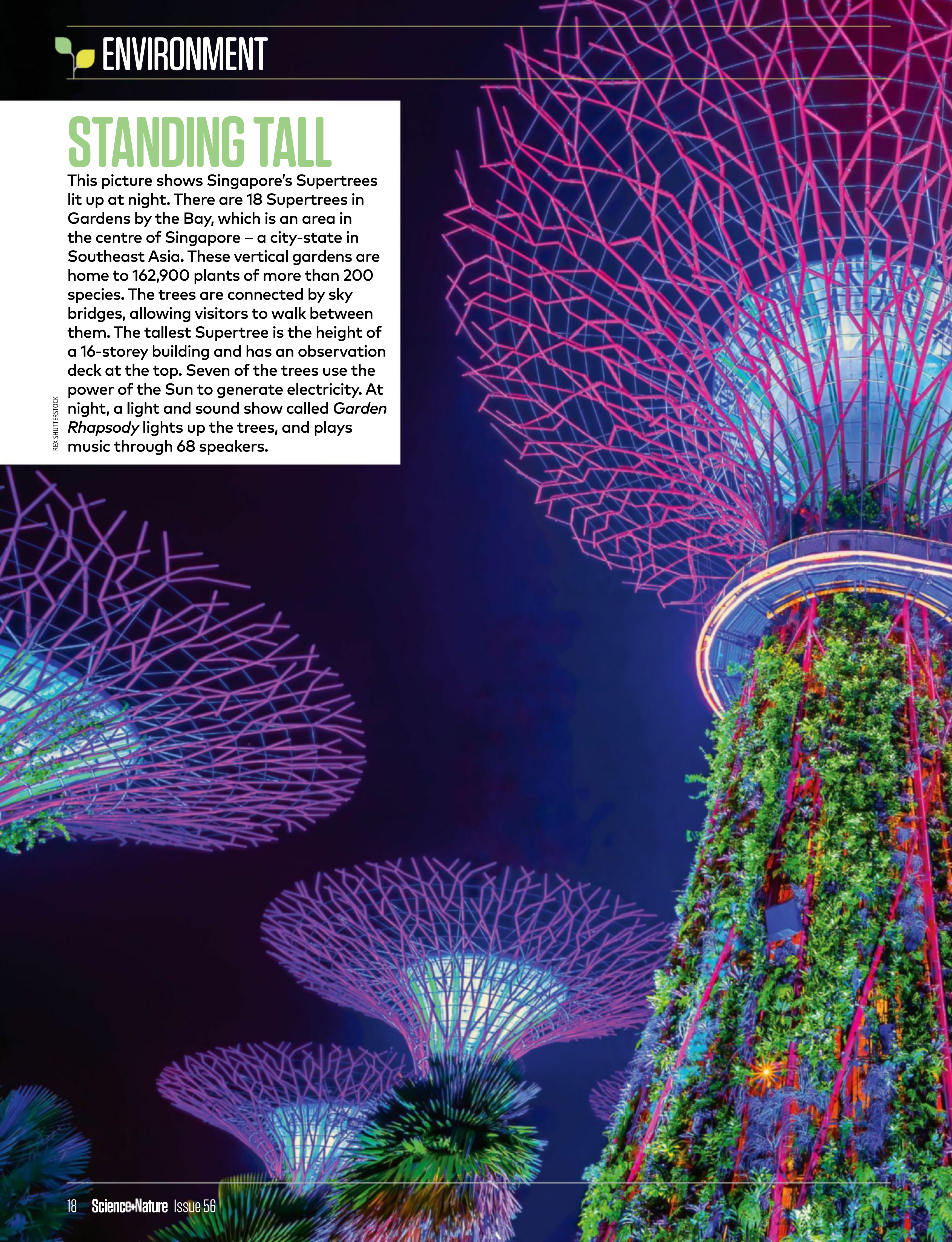
The loss of Antarctic ice will also speed up climate change. Shrinking sea ice and ice shelves mean that less sunlight is reflected back into space by their bright white surfaces, which, in turn, increases global warming. A warming Southern Ocean means fewer krill – and that's less food for whales and seabirds.

Thwaites glacier is melting at a rapid rate.

Hope for the future

The history of science in Antarctica gives us hope that we can reverse changes caused by humans. Around 50 years ago, scientists realised that a huge hole had opened up in the ozone layer of the atmosphere over the South Pole. Ozone gas is a vital sunscreen for the planet, which blocks out the worst of the Sun's radiation. The discovery led to international efforts to ban chemicals, called CFCs, that were causing the ozone gas to break down.

For 200 years, scientists have braved the deadly extremes of Antarctica in the hope of better understanding our fragile planet – its past, present and future. They have shown us that we all depend on this brilliant, beautiful, frozen continent. They have also shown that by working together to protect Antarctica, we can protect the entire planet.



STANDING TALL

This picture shows Singapore's Supertrees lit up at night. There are 18 Supertrees in Gardens by the Bay, which is an area in the centre of Singapore – a city-state in Southeast Asia. These vertical gardens are home to 162,900 plants of more than 200 species. The trees are connected by sky bridges, allowing visitors to walk between them. The tallest Supertree is the height of a 16-storey building and has an observation deck at the top. Seven of the trees use the power of the Sun to generate electricity. At night, a light and sound show called *Garden Rhapsody* lights up the trees, and plays music through 68 speakers.

REX SHUTTERSTOCK

GOING GREEN

Singapore is one of the world's greenest cities, with nearly half of its land covered in green spaces.

Steve Backshall

Meet the danger-loving naturalist who is passionate about wildlife.

Steve Backshall's favourite animal is the orca, also known as the killer whale. "They are so complex, because there is still so much more we have to learn about them," he tells *The Week Junior Science+Nature*, "They are incredibly beautiful and one of the most exciting animals to film." Orcas are just one of the animal species Backshall has encountered during his career as a naturalist (an expert who studies animals and plants) and wildlife presenter on TV shows such as *Deadly 60*.

Call of the wild

Growing up, Backshall always had a love for wildlife. "My family tell stories of me searching for snakes in the compost heap when I was very, very young, and I've always had that same passion," he says. His family were lucky enough to travel lots, and Backshall did safari walks in Africa and visited places such as India. His passion for nature and exploring remained strong as he got older, leading Backshall to become a naturalist.

Documenting wildlife

In his first television show, Backshall journeyed to the jungles of Colombia, in South America, where he braved dangerous snakes and even ended up in jail. The National Geographic channel, which makes documentaries about wildlife, science and exploration, took an interest in Backshall's skills and hired him as an "adventurer in residence".

TEEMING WITH LIFE

The Amazon rainforest is home to more species of animals and plants than anywhere else in the world.

Island paradise

The Galápagos Islands were formed by volcanoes erupting, which created 13 large islands and six smaller ones in the Pacific Ocean. Europeans first saw them in 1535, but it was Charles Darwin's visit to them in 1835 that highlighted their importance to the world. The islands are a laboratory for studying wildlife, because they are home to species that don't live anywhere else in the world. This includes Galápagos giant tortoises, which are believed to have some of the longest lifespans of any creatures on Earth. Find out more about the Galápagos Islands in the next issue of *The Week Junior Science+Nature*, out on 6 January.

Giant tortoise.

REX SHUTTERSTOCK

His new role involved filming, presenting and producing adventure and nature programmes, and allowed him to do what he loved most: travelling and discovering wildlife.

Backshall's favourite place to visit is the tropical rainforest. "If I don't find the jaguar or ocelot or harpy eagle that I'm searching for, I know that I will find an interesting invertebrate or frog or snake," he says. The boundless possibilities within the rainforest mean that he always has something to film.

Living dangerously

Deadly 60 is one of Backshall's best-known shows, in which he criss-crosses the globe in search of 60 of the most dangerous animals – the kinds of creatures that most people usually avoid. Although he discovered and interacted with some amazing creatures during his time on the show, he also had his fair share of hair-raising encounters. One time, a hippopotamus – the world's third-largest land mammal – approached him stealthily underwater without him noticing. "I wasn't expecting it and it was absolutely terrifying," he admits.

Extraordinary encounters

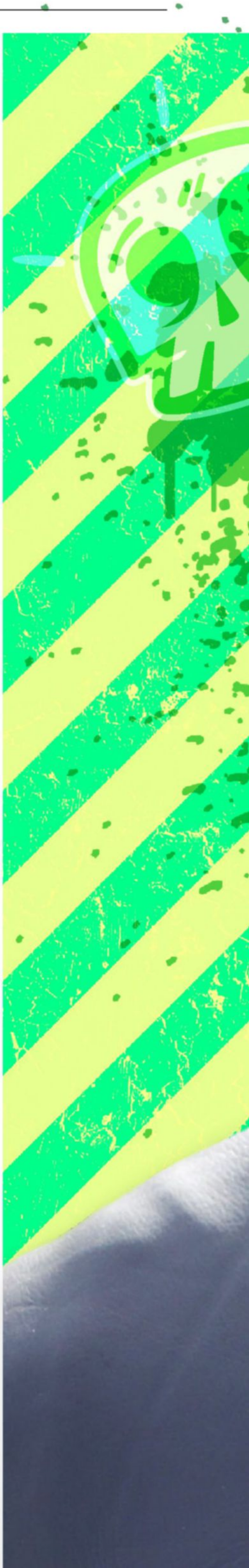
Although he has come face-to-face with plenty of animals that many people would find terrifying, Backshall has also enjoyed a huge number of incredible experiences. He remembers free-diving with blue whales in Sri Lanka. Blue whales are the largest animal on Earth, weighing as much as around 33 elephants and growing to more than 30 metres in length. "When you are alongside them," Backshall says, "You feel very, very small indeed."

He has also had some extraordinary encounters during several visits to the Galápagos, a group of volcanic islands in the Pacific Ocean that are teeming with unique wildlife. "We have had amazing underwater dances with sea lions," he says, "The shores are awash with bright pink flamingos and land iguanas."

The future of the planet

Exploring the natural world isn't the most important thing for Backshall. He also wants to work to conserve nature and protect it from the effects of climate change. Climate change is the long-term shift in the world's weather patterns, including rising temperatures, caused mostly by human activities including farming, cutting down forests and burning fossil fuels (coal, oil and gas).

Backshall supports and works with a number of charities to help young people realise the importance of wildlife conservation. His work on these kinds of charity campaign and other wildlife programmes also helps to educate and inform young people about how they can help the environment. Backshall recently started up a campaign called Operation Ocelot, with the World Land Trust, where young eco-warriors can raise money to save parts of the Atlantic Forest in Brazil. Seeing the enthusiasm of young people for these projects gives Backshall a real hope for the future of planet Earth.



BIG EATER
The average orca eats around 227 kilograms of food a day, ranging from seals to sharks.

Wildlife watch

Prepare to be amazed by the wonderful wildlife that braves the cold this winter.

December is a strong contender for the most beautiful month of the year. Although it doesn't have the bright blooms of summer or the golden tones of autumn, it has the magic and sparkle of frost, which adorns every surface with shimmering crystals. The deciduous trees are empty of leaves now, so it can take a little more searching to find December's colours. If you wander into a woodland, though, you're sure to find vibrant green ferns, berry-laden shrubs and – if you're lucky – brightly feathered visitors from the Arctic.

Among those visitors are starlings that come to the UK in large numbers. They gather in huge roosts, often in the same place year after year. If you hear of one such gathering nearby, it's well worth a trip to see them. Arriving early, you may be confronted with a large amount of bird poo and a lot of noisy squawking. You could be forgiven for wondering what all the fuss is about – but wait! Just before dusk falls, the starlings take to the air. It's an unforgettable sight – thousands of birds moving as one, twisting and turning in the sky in a beautiful spectacle called a "murmuration".

AT RISK SPECIES

Starling numbers have fallen by 80% in recent years, and are one of the UK's most threatened birds.

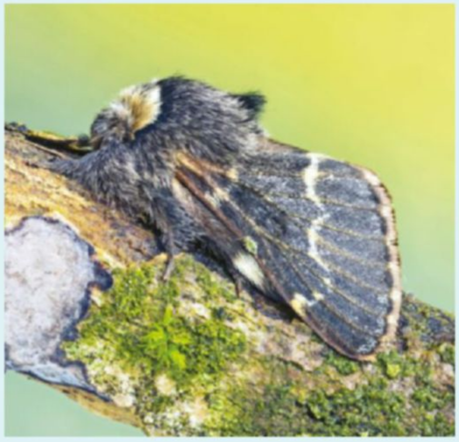
A starling murmuration.

GO NUTS!

Lime green and spiky, sweet chestnut casings are easy to spot among the fallen leaves. Break them open to find shiny brown nuts, which you can roast.

Chestnuts in a spiky case.

December moths



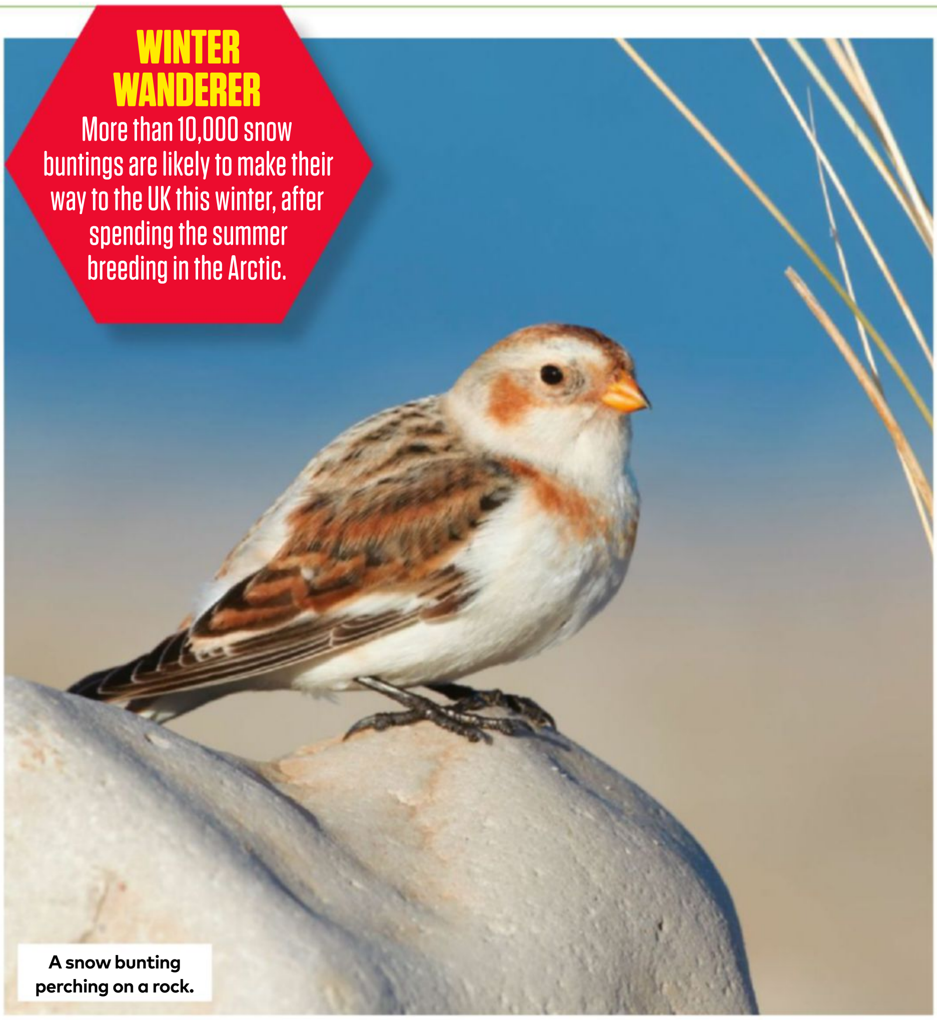
Well dressed for the cold, December moths have fluffy bodies and wide furry shoulder pads, which extend in a strawberry blonde mane around their heads. Their faces are framed by long, fronded antennae, which are as impressive as the antlers of any reindeer. Female December moths are much bigger than males, but equally well-dressed. Their bulky fur coats make them easy to tell apart from the other moths you are most likely to spot at this time of year, although they only come out at night, so you are most likely to find them if you set up a moth trap.

Winter gnats

We see much less of the Sun during the winter months, so the second it makes an appearance, male winter gnats grasp the opportunity to dance in its rays in the hope of attracting a female. Groups of these gangly-legged flying insects, known as "leks", can be found anywhere that has been warmed by the Sun.

WINTER WANDERER

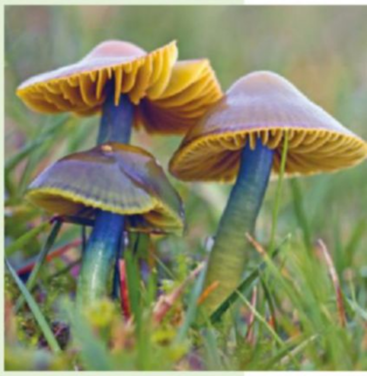
More than 10,000 snow buntings are likely to make their way to the UK this winter, after spending the summer breeding in the Arctic.



A snow bunting perching on a rock.

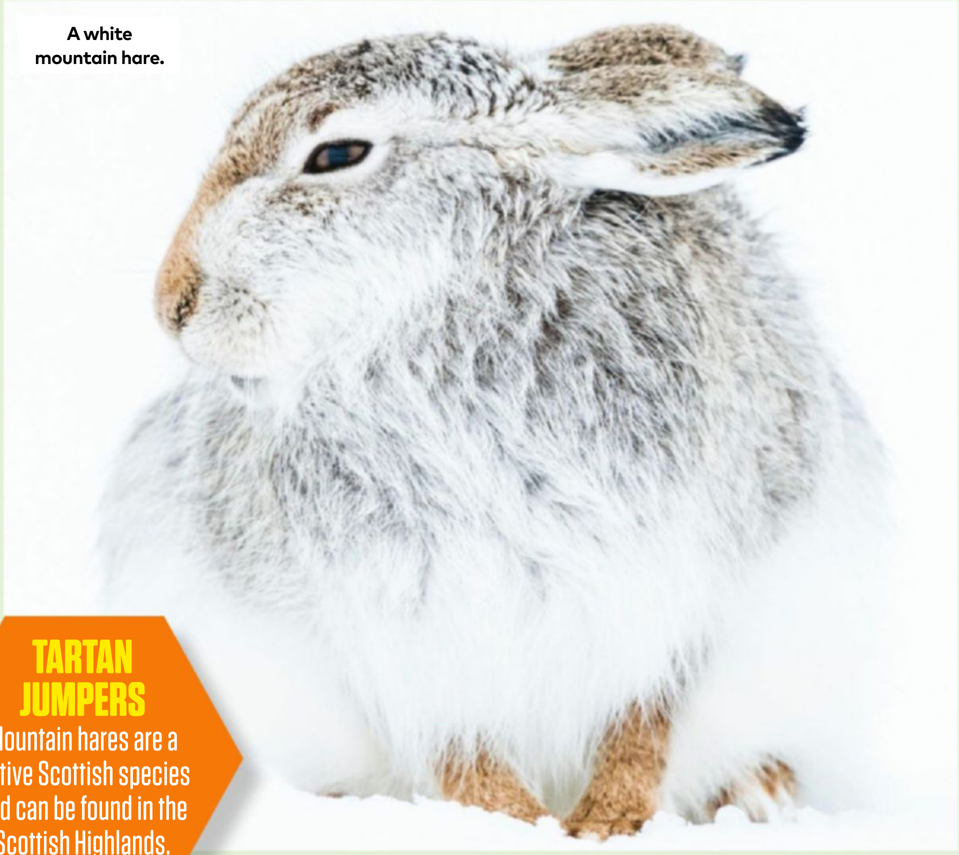
Parrot waxcaps

Parrot waxcaps thrive in long grass that is untouched and untreated, so they are most often found in churchyards and pastures. They are small and slimy mushrooms that are often difficult to spot because of their green colouring. As they age, the bright green fades to a dull yellow, making them a little easier to see.



Animals that turn white in winter

If your lifestyle relies on you blending in with your surroundings, when those surroundings change, you must too. Some parts of the UK are often blanketed in snow over the winter months, meaning that animals with brown coats – which are safely disguised for the rest of the year – suddenly stick out like a sore thumb. To disguise themselves, mountain hares, stoats and ptarmigans turn white for winter. For hares and ptarmigans, this colour change helps them stay hidden from predators.



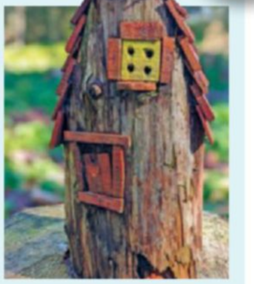
A white mountain hare.

TARTAN JUMPERS

Mountain hares are a native Scottish species and can be found in the Scottish Highlands.

Build an elf house

DO IT!



Natural materials lying around outdoors, such as acorn cups, fallen leaves and stones, are perfect for creating an elf house. Start with a basic structure (tree stumps work well), then add details, such as moss for carpets and twigs as fences. If you're feeling particularly creative, why not go wild and make a whole elf village. These structures are perfect for little animals to live in, too!

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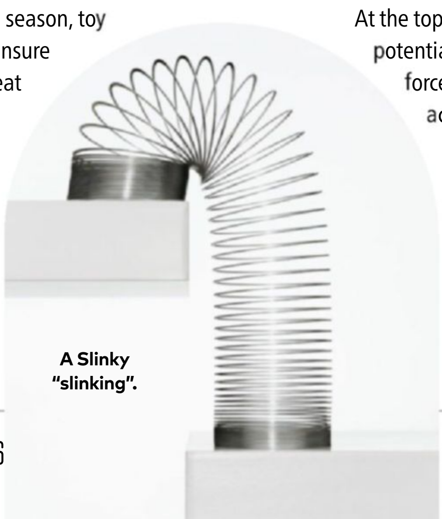
TOY STORIES

Discover the science and technology behind your favourite games.

For many, the festive season marks the busiest time of year for gift-giving. Whether it's for Christmas, Hanukkah or Kwanzaa, people across the country will soon enjoy receiving and sharing presents with loved ones.

Parents and grandparents will remember when dolls, footballs and bicycles were at the top of their lists to Santa. Although these sorts of simple playthings are still popular, more modern games and toys are more likely to include some advanced technology.

In the run-up to the festive season, toy companies work tirelessly to ensure that their latest models can beat the competition and become this year's "must-have" toy. So, as your presents are being ordered, delivered and wrapped up, let's look back at some of the best toys of all time. We may even break them open and discover how they work.



A Slinky "slinking".

Slinky skills

The Slinky hardly seems impressive compared to today's electronic devices. However, the simple somersaulting spring has a lot going for it.

An engineer called Richard James stumbled upon the joys of the Slinky in 1943, when he was making springs that would protect equipment from falling over on ships. So the story goes, he knocked one over and – to his surprise – the spring appeared to walk instead of fall. A Slinky's amazing ability to walk down stairs is all down to physics.

At the top of the stairs the spring has potential, or stored, energy. As the force of gravity acts on it, the Slinky accelerates (speeds up) as its weight transfers from one end of the spring to the other. Once the mass (weight) is in motion it takes a force to stop it. The momentum of the Slinky when it hits the step below, flips the opposite end over and the cycle

A timeline of "must-have" toys

View-Master

First released: 1939

Tech: These special viewing goggles trick your eyes into seeing 3D visuals.

Scalextric

First released: 1957

Tech: Electric currents power model cars as they race around a miniature track.

LEGO

First released: 1958

Tech: With basic bricks and special components, these building blocks let you find your inner engineer.

Game Boy

First released: 1989

Tech: This portable gaming console is the grandaddy of the Nintendo Switch.

Bigtrak

First released: 1979

Tech: This programmable six-wheeler is controlled using a small onboard keypad.

Transformers

First released: 1984

Tech: These toys change from cars into robots – and back again.

Furby

First released: 1997

Tech: These friendly, furry robot creatures appear to learn how to speak English.

Nintendo Switch

First released: 2017

Tech: An adaptable hand-held gaming console that can be used on the go, or on your TV screen.

Novie

First released: 2019

Tech: A quick-learning, cheerful android that can be taught all sorts of moves.

Meta Quest 2

Date first released: 2020

Tech: This virtual-reality gaming headset transports you to another world entirely.

OLD TIME TOYS

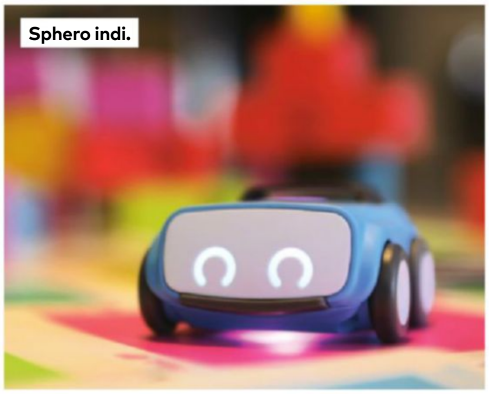
The oldest toy ever discovered was a 4,000-year-old rattle in Turkey.

Sphero Mini.

IDEAL'S
Robert the Ro
REMOTE
TALKING Device!
YOU STEER
NO. 4049

Robert the Robot.

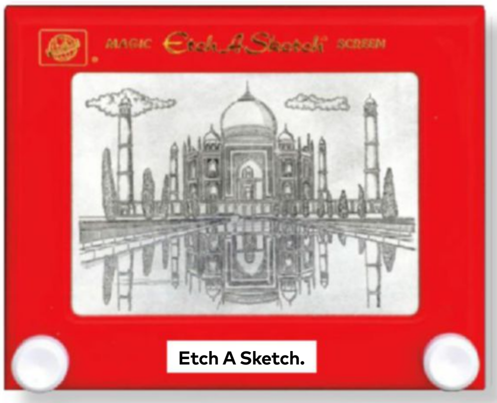
A hoverboard.



Sphero indi.

Vtech JotBot.

repeats. Essentially, a Slinky's "walking" effect is a series of end-over-end somersaults.



Etch A Sketch.

Keeping up with demand

The Slinky is an early example of a toy that became a big hit, and in the second half of the 20th century, the demand for toys grew and grew. More children were born after the Second World War (a period known as the Baby Boom) and festive gift-giving became increasingly popular. Companies quickly realised that jazzing up their toys with awesome tech would make them stand out.

By the 1960s, techy toys were stocking staples. The Etch A Sketch is a great example of science creating a lot of fun. If you've never seen one before, imagine holding a tablet computer on its side. In the bottom corners are large knobs, which can be turned either way. Inside the toy, behind a glass screen, is a powder made of aluminium metal.

The powder sticks to the inside of the screen, giving it a light grey colour. By twiddling the knobs, you move an internal stylus (a rod that can tap or scratch) up and down, or left and right. This scrapes off some of the powder, revealing a darker colour. People could draw or write messages on their Etch A Sketches. When they were done, a big shake of the toy would make all the markings disappear again, ready for fresh creations.

Giant leaps forward

In the decades that followed, toys were transformed. The 1970s and 1980s saw the introduction of video game consoles, which changed the way that people played. Cheaper and better technology meant that manufacturers could cram in more computing power, and the age of robot toys began.

In fairness, the very first toy robot was produced a little earlier, in 1954. Named Robert the Robot, he could move around, light up his eyes, and say, "I am Robert Robot, mechanical man. Drive me and steer me, wherever you can."

By today's standards, Robert is very basic. This Christmas, there will be a much wider range of smart machines waiting to be unwrapped – whether it's the Vtech JotBot, which can draw pictures with you; the ZOOB BuilderZ that allows you to construct your own interactive robots in whatever shape you like; or the programmable Sphero BOLT that can be fully coded. So, why are there suddenly so many robots? Well, there are a few reasons.

Inside the robots

Many of today's toys have been fitted with programmed intelligence – this means they are able to respond to instructions. If you give the

Some new toys use VR technology.

VIRTUAL MARATHON

A man called Collin Cabral once spent more than 48 hours playing VR video games non-stop.

Building the future

One challenge that toymakers now face is how to make sure their products are environmentally-friendly, as well as fun to play with. In 2021, Danish toy company LEGO unveiled a prototype brick made entirely from recycled plastic bottles. The LEGO Group's scientists have tested more than 250 variations of this brick, all of which were made using PET (polyethylene terephthalate) – the type of plastic found inside plastic bottles. In the next few years, they hope to begin introducing these recycled bricks into LEGO sets.

By 2025, the LEGO Group aims to have all packaging made from recycled materials. Sets can now be found with paper-based bags inside, instead of plastic. What's more, the company has promised to make all its products from sustainable materials by 2030. It's not just about producing new sets, though, but also about looking for ways to reduce waste. Building toys that last a long time is important. In the US and Canada, LEGO Replay is a scheme where people can donate their used sets, giving LEGO toys a longer lifespan. There are plans to expand this scheme to other countries.

A drawing showing LEGO testing new materials.

right command, a robot can speak, sing or spin around. Because smartphones are so widespread, toy developers use phones to run apps that send commands to the robot and control interactions with it. Back in Robert's day, that wouldn't have been possible and the robot had to contain all the instructions inside itself.

Virtual reality

Toymakers don't even need to base their creations in reality any more . Virtual reality allows them to create new worlds that don't really exist. This brings whole new opportunities. The 2020 game Mario Kart Live: Home Circuit blended real-world fun with virtual reality to great success. Players construct a racecourse in their home and then drive real toy cars around the course. The cars send signals back to a Nintendo Switch, which adds in virtual features like power-ups, animated characters and obstacles. This is a great example of how old-fashioned toys are being updated with new tech.

Into the future

What will toys look like in the next five, 10 or 20 years? Although today's toy robots are way smarter than Robert the Robot, they still don't have the next-level intelligence you see in films and TV droids and robots. That could all change in the next few years, however, as the latest technology becomes affordable and small enough pack into toys.

Luigi in Mario Kart.

Hoverboards, which used to be the stuff of science fiction, are already flying off the shelves. To be clear, these amazing two-wheeled self-balancing boards don't really hover. They have sensors that can detect whether the user is leaning forward, backwards, to the left, or to the right. A computer inside the hoverboard uses this data to move or turn it. Hoverboards that actually *do* hover are on their way, too. The Guinness Book of World Records has already recognised a device, made by a company called Omni, that uses propellers to fly.

Vivek Goyal, the head of interactive toy company PlayShifu, has said that hover toys, toys that can recognise your voice or face, and toys that connect with the internet and each other, are all likely to become more popular.

If anything can be learned from the past, it's that new toys will share connections with the games that your parents and grandparents played. Maybe the next generation of remote-controlled cars will be able to fly or drive underwater. Perhaps the teddies of the future will contain artificial intelligence, and they will be able to detect when you're feeling upset or when you're feeling happy. Maybe virtual reality will take over from older Etch A Sketch and tablet-based drawing, and you'll be using a headset to create digital masterpieces just by waving your hands.

Whatever happens, technology is sure to be fuelling hours of fun for a long time yet.

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Abominable Snowman

Could there be a giant creature living high up in the lonely Himalayan peaks?

Stories of wild hairy giants living in the snow are part of growing up in the mountains. Tales of large bipedal creatures (an animal that walks on two legs) living within the foothills of the Himalayan mountains have been around for over 2,000 years. The legend of a Yeti, or Abominable Snowman, is deeply rooted in Sherpa (people from Nepal and Tibet, and native to the mountain range) culture, but where do these tales come from? What is the creature – and is it really possible such a giant could exist?

Footprints in the snow

British journalist Henry Newman was the first to report "very large footprints" on Everest, which his Sherpa guides said belonged to the *metoh-kangmi*, Tibetan for "man-bear snow-man". The creature was said to be between 1.5 and 4.5 metres tall with black, brown or grey fur. Newman mistranslated its name, adding "abominable" (horrible) to snowman – and the beast got its infamous name. Reports of Yetis soared as more Western adventurers began exploring Everest. The most famous sighting occurred in 1951 when English mountaineer Eric Shipton stumbled upon a set of footprints in the snow. Photos show that the prints are much larger than human ones with the toes in different locations. A member of the Shipton team wrote in his diary that the Abominable Snowman "is not a myth".

The Himalayas.

More recently, in 2019, the Indian Army shared photographs of supposed yeti footprints taken by their Mountaineering Expedition Team, claiming the "elusive snowman" was on the move. The prints were 81 centimetres long and it's not clear what might have made them. Even the footprints of the world's largest bears (polar and Kodiak bears) are only about 30cm long.

A Yeti footprint.

What is a Yeti?

Yetis are often depicted as solitary and friendly creatures in films and stories. What isn't clear is whether sightings are of the same single animal or if there could be multiple snowmen.

Tibetan folklore actually describes three different varieties of Yetis. The largest, at 4.5 metres tall and with thick black fur, is the *Nyalmo*. It looks similar to a very large bear, eats yaks (an animal native to the region) and supposedly smells of garlic. The *Chuti* looks like the Himalayan red bear or Himalayan brown bear and, according to biologist Charles Stonor, that's how Sherpas recognise it. The *Rang Shim Bombo* is the smallest Yeti (1 to 2 metres) with reddish-brown fur. They're all very important to the Sherpa people. Yeti are depicted on walls of temples and one monastery (where monks live and work) in Nepal claims to have a Yeti's scalp (top part of the head) kept in a box.

Bear with us

Biologist Charlotte Lindqvist says the answer to "the Yeti legend can be found in local bears". In an effort to solve the mystery, scientists in 2017 tested nine specimens that supposedly came from Yetis including bone, hair, skin and faeces (poo). One specimen matched the DNA of a dog and the other eight matched a variety of Asian bear species.

Bryan Sykes, a University of Oxford geneticist (someone who studies genes – short sections of DNA in the cells of every living thing), took DNA from hair samples of suspected Yetis in 2013 and found they matched sequences from a 40,000 year old polar bear jaw found in Svalbard, near the north pole. Speaking to BBC News, Sykes said the creature could be a hybrid (mixture) between a polar bear and brown bear. He says such a beast may well be the source of the mystery and the source of the legend.

Not Yet-i

While these studies of samples may have disappointed Yeti hunters, it hasn't deterred them. Locals still love the tale of the Abominable Snowman – and the people it brings to the mountains. Explorers from around the world flock to Everest, perhaps because, in the words of Henry Newman, the man that coined the creature's name, "the whole story seemed such a joyous creation".

Bigfoot

Instead of a bear, many modern-day believers think the Abominable Snowman could be a type of extinct ape known as *Gigantopithecus*. This polar-bear sized animal was the largest primate (a group of mammals that includes monkeys, apes and humans) that ever lived, and went extinct 350,000 years ago. *Gigantopithecus* is also a candidate for another famous hairy, human-like creature – Bigfoot. This mythical beast, also known as the Sasquatch, is said to live in the forests of north-western America. We investigated the case in our *Mysteries of Science* podcast. To listen to it, just scan this QR code.

MYSTERIES OF SCIENCE PODCAST

SCAN ME

A Bigfoot sighting.

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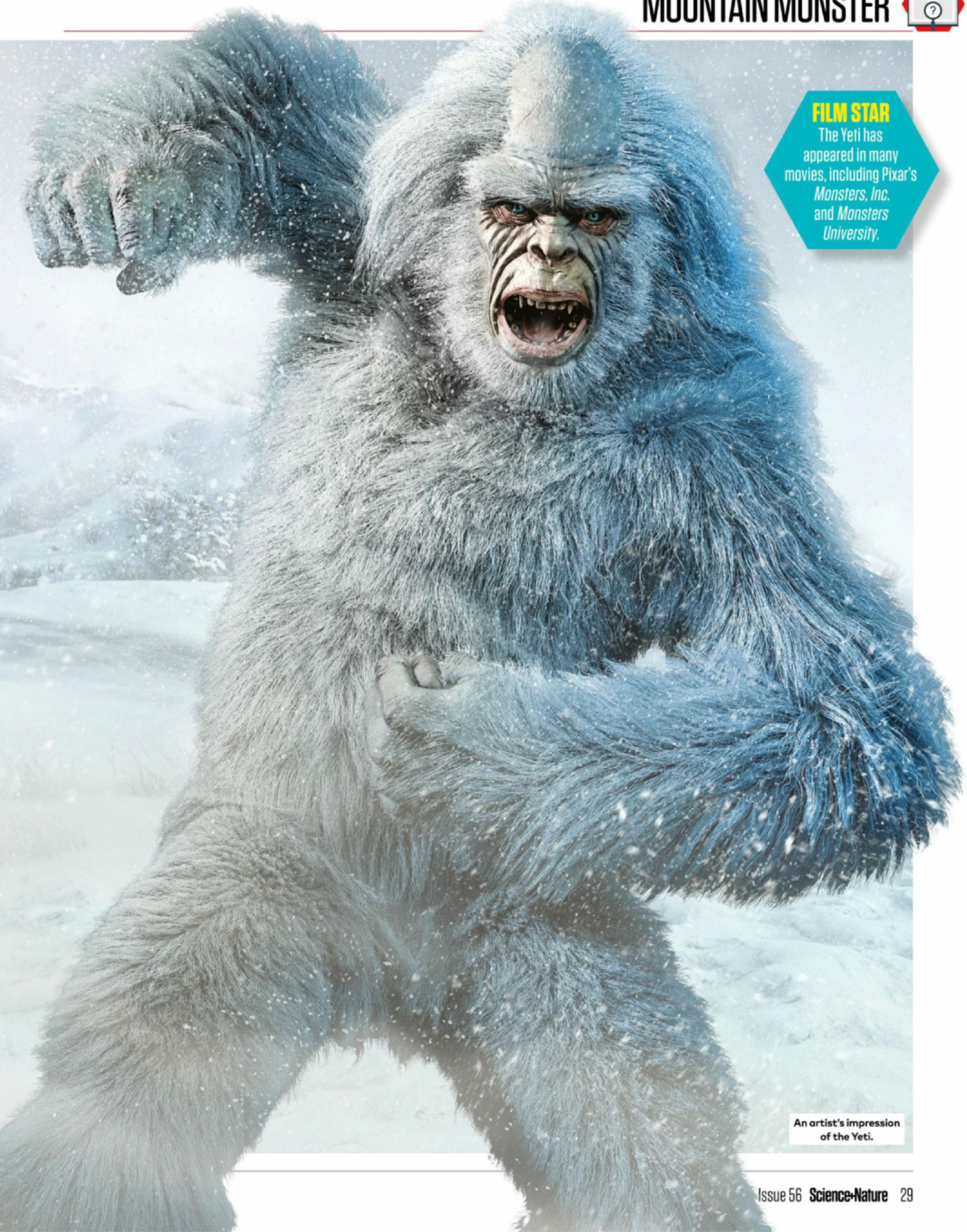
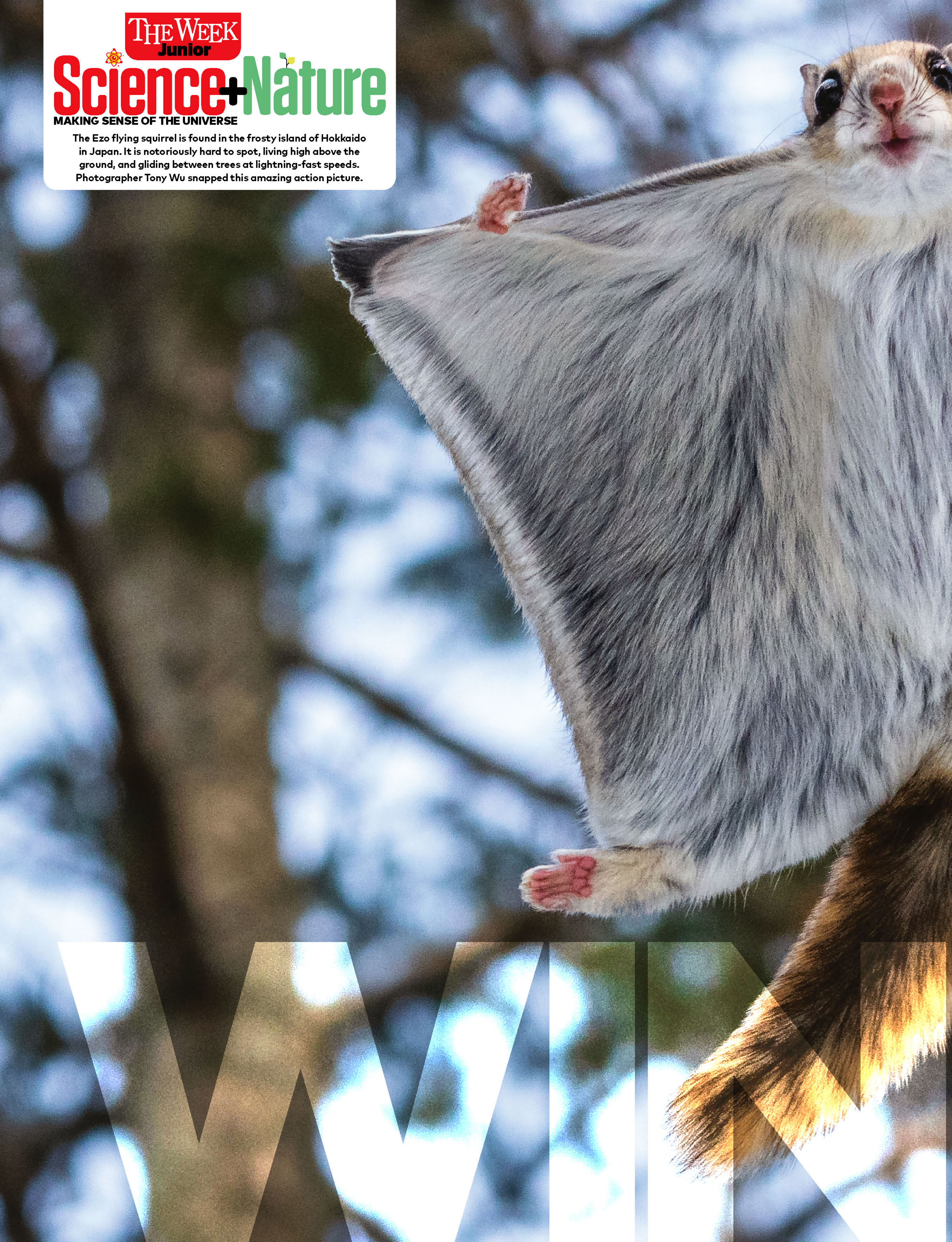


FILM STAR
The Yeti has appeared in many movies, including Pixar's *Monsters, Inc.* and *Monsters University*.

An artist's impression of the Yeti.

THE WEEK Junior
Science+Nature
MAKING SENSE OF THE UNIVERSE

The Ezo flying squirrel is found in the frosty island of Hokkaido in Japan. It is notoriously hard to spot, living high above the ground, and gliding between trees at lightning-fast speeds. Photographer Tony Wu snapped this amazing action picture.



WIN

EZO FLYING SQUIRREL

GIT!

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SPECTRE

Rolls-Royce reveals its first all-electric luxury car.

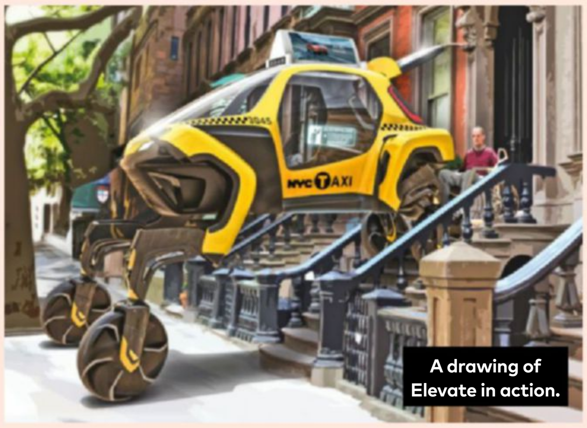
In 1900, the British engineer Charles Rolls said, "The electric car is perfectly noiseless and clean. There is no smell or vibration. They should become very useful." He set up a car company with Henry Royce, and in 1904 the first Rolls-Royce cars went on sale. Charles was well ahead of the game, because it took another 118 years for his company to finally produce its first all-electric model, called Spectre.

"Rolls-Royce" is often used to describe something that is the best at what it does. The "Rolls-Royce of toasters" always cooks bread perfectly; the "Rolls-Royce of lawn mowers" cuts every blade of grass; and the "Rolls-Royce of pencil sharpeners" never breaks the lead. However, Rolls-Royce itself does not make any of these things. Instead, the company tries to make the world's most luxurious cars. In this way the Spectre actually is the Rolls-Royce of electric cars.

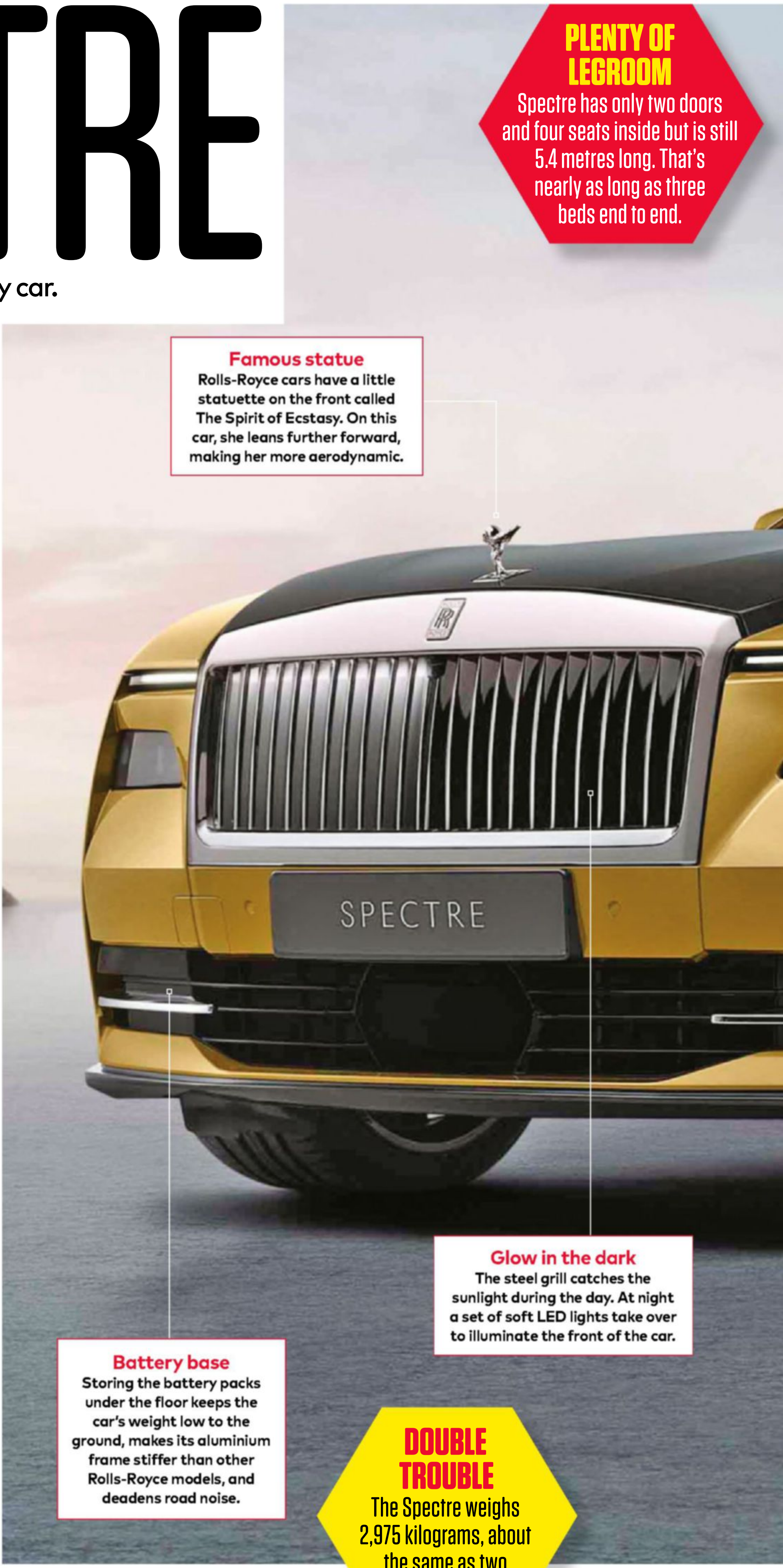
A ride in a Rolls-Royce is famous for being quiet and smooth. The Spectre's pair of electric motors are quieter than a petrol engine, yet they can power the car from 0 to 60 miles per hour in 4.4 seconds. The car's Planar suspension takes care of bumps in the road by briefly separating a wheel from the main framework so it can roll over rough patches without making the rest of the car shake or wobble. So, the Spectre's soft seats can take you 320 miles in perfect comfort and it will do it without producing any smoky exhaust emissions. Charles Rolls was right all along!

A walking car

Although the Spectre uses a computer-powered suspension system to keep the ride smooth, Hyundai's Elevate car will take the idea a step further – literally. Elevate, which is still being developed by the Korean company, has wheels on the end of folding robotic legs. It works by pairing electric car technology with robotics. If Elevate comes to an obstacle in the road, it just rears up and steps over it. The smart vehicle will also be able to climb up walls, walk up the stairs, wade through water, pick its way across rubble and even jump across gaps.



A drawing of Elevate in action.



PLENTY OF LEGROOM

Spectre has only two doors and four seats inside but is still 5.4 metres long. That's nearly as long as three beds end to end.

Famous statue

Rolls-Royce cars have a little statuette on the front called The Spirit of Ecstasy. On this car, she leans further forward, making her more aerodynamic.

Glow in the dark

The steel grill catches the sunlight during the day. At night a set of soft LED lights take over to illuminate the front of the car.

Battery base

Storing the battery packs under the floor keeps the car's weight low to the ground, makes its aluminium frame stiffer than other Rolls-Royce models, and deadens road noise.

DOUBLE TROUBLE

The Spectre weighs 2,975 kilograms, about the same as two hippopotamuses.

COURTESY OF ROLLS-ROYCE MOTOR CARS · HYUNDAI

A ceiling full of stars

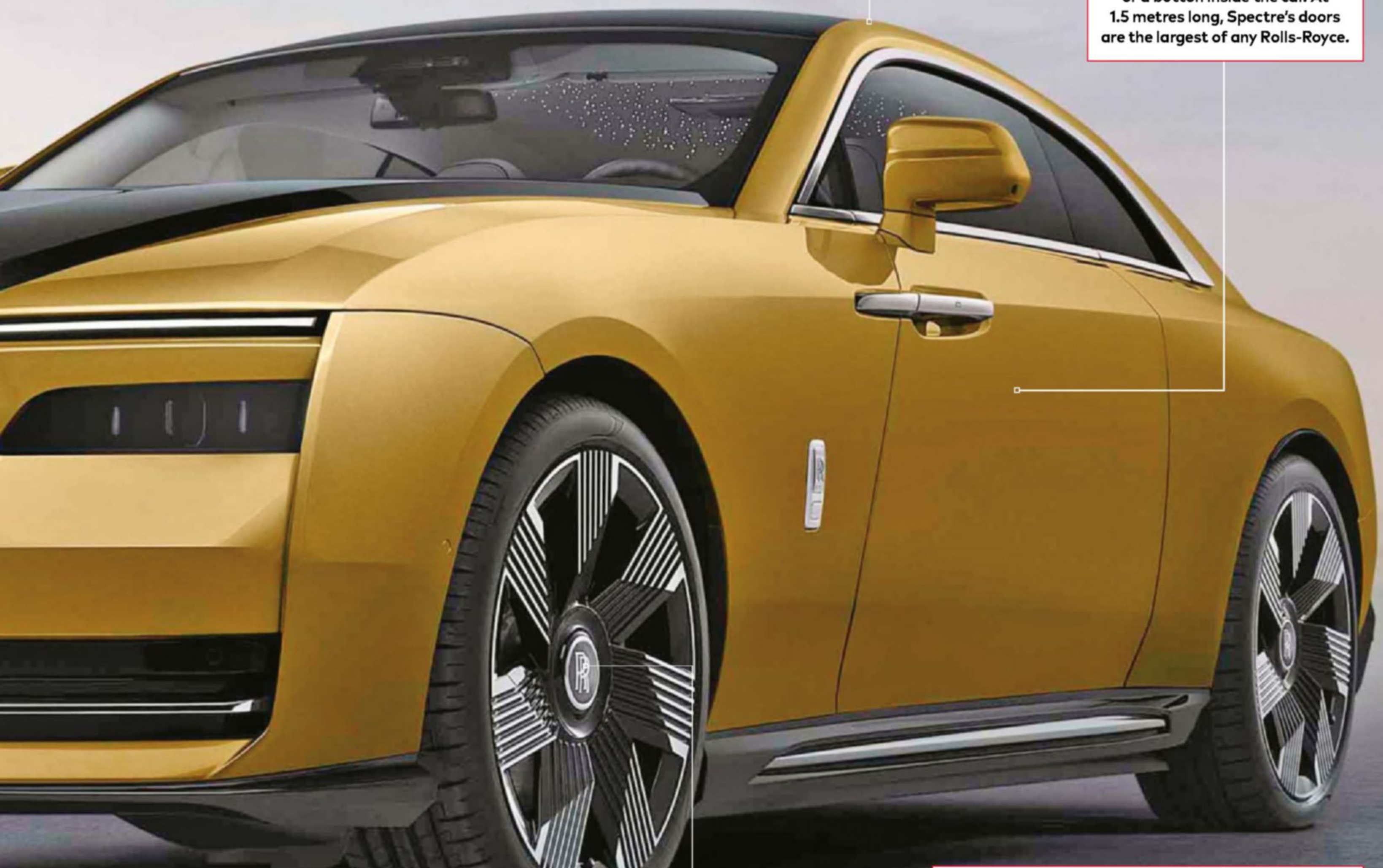
The lining that covers the inside roof and doors of Spectre has 4,796 tiny lights stitched into it. When it's dark outside, the inside of the car can be filled with its own starlight!

Sleek lines

Spectre is the most aerodynamic Rolls-Royce ever, so the air rushing around it does not drag too much. This helps to make the big and heavy car more efficient, which saves energy.

Automatic doors

The doors open backwards and are operated by a key fob or a button inside the car. At 1.5 metres long, Spectre's doors are the largest of any Rolls-Royce.



Big wheels

Spectre's wheels hold 23-inch tyres, the largest of any Rolls-Royce model. The car also has all-wheel steering, which means the back wheels turn a little as well as the front ones.

All wheels go!

The car has one motor for the front wheels and another for the back. The motors provide the right amount of power to each wheel individually, in a system called all-wheel drive.

At the controls

Spectre contains seven kilometres of cables connecting controllers and sensors to the driver's dashboard display. All that data is collected by an app, which the driver can use to control the car from inside and out.

Why can't we throw all our trash into a volcano?

Could lava melt our litter?

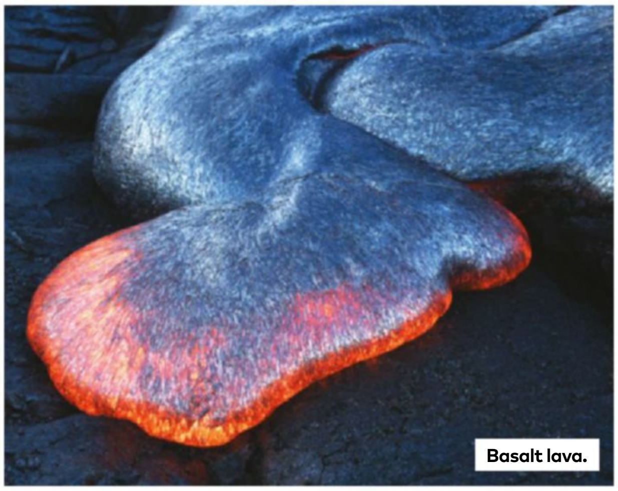
It's true that lava is hot enough to burn up some of our trash. When Kilauea erupted on the Big Island of Hawaii in the US in 2018, the lava flows were hotter than 1,100˚C. That's hotter than the surface of the planet Venus, and hot enough to melt many rocks. It's also similar to waste incinerators, which usually burn rubbish at between 1,000˚C and 1,200˚C.

Burn, baby, burn!

Not all lavas are the same temperature, however. The eruptions in Hawaii produce a type of lava called basalt. Basalt is much hotter and more runny than lavas that erupt at some other volcanoes, such as the thicker dacite lava that erupts at Mount St Helens in the US state of Washington. For instance, during its 2004–2008 eruption, Mount St Helens produced a lava dome with surface temperatures of only about 704˚C.

Although molten rock at 1,000˚C can melt lots of materials found in bins – including food scraps, paper, plastics, glass and some metals – it's not hot enough to melt many other common waste materials, such as steel, nickel and iron.

Lava erupts from Kilauea volcano in Hawaii.



Basalt lava.

Apart from temperature, there are other good reasons not to burn garbage in volcanoes. Firstly, there aren't many volcanoes that have lava lakes. These open, bowl-like craters are full of hot, molten rock, into which junk might be dumped. Of all of the thousands of volcanoes on Earth, scientists know of only eight with active lava lakes. They include Kilauea, Mount Erebus in Antarctica, and Nyiragongo in Africa's Democratic Republic of the Congo. Most active volcanoes have craters filled with rocks and cooled lava, like Mount St. Helens, or with water, like Crater Lake in Oregon, US.

The second problem is that throwing trash into an active lava lake would be a very dangerous job. Lava lakes are covered with a crust of cooling lava, but just below that crust they are molten and intensely hot. When rocks or other materials fall onto a lava lake, they will break the surface crust, disrupting the underlying lava and causing an explosion. This happened at Kilauea in 2015 when blocks of rock from the crater rim fell into the lava lake and caused a huge explosion that spat rocks and lava up and out of the crater. Anyone who threw litter into a lava lake would have to run away, dodging flaming, flying garbage.

What if it were possible?

Suppose it was possible to dump rubbish safely into a lava lake. What would happen to it? When plastics, garbage and metals burn, they can release toxic gases. Volcanoes already give off tons of harmful gases, including sulfur, chlorine and carbon dioxide.

Sulfur gases can create acidic fog, called "vog" (short for "volcanic fog"). It can kill plants and cause breathing problems for people nearby. Mixing these already-dangerous volcanic gases with other toxic gases from burning rubbish could make the resulting fumes even more harmful for people and plants near the volcano.

Finally, many indigenous communities view the volcanoes they live near to as sacred places. Indigenous people are descendants of those who lived somewhere before another culture arrived and took over. For example, Halema'uma'u crater at Kilauea is considered the home of Pele, the Hawaiian goddess of fire, and the area around the crater is sacred to native Hawaiians. Throwing trash into volcanoes would be a massive insult to those cultures.

Created by Emily Johnson, Research Geologist, US Geological Survey. Published in association with theconversation.com

THE CONVERSATION

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LIFE
OF THE FOREST
THE WEEK
KING TUT

RING OF FIRE

The "Ring of Fire" is an area around the Pacific Ocean that is home to 75% of the Earth's active volcanoes.

Blast off!

We have lift-off! It's been a landmark month in space.

Last month saw the long-awaited launch of Artemis I – marking the start of a new era of space exploration. The Artemis programme aims to take astronauts back to the Moon by 2025.

After a few delays, Artemis I finally blasted off from Kennedy Space Centre in Florida, US on 16 November with the announcement, "We rise together, back to the Moon and beyond." Artemis I is an uncrewed test flight. Its spacecraft, Orion, will orbit the Moon for about six days before returning to Earth on 11 December. Last month also saw discussions on what can be done to protect our home planet, Earth. World leaders, businesses and environmental groups went to Egypt for COP27 to try to tackle climate change (long term changes to weather including rising temperatures). One company called Space Energy Initiative (SEI) wants to build a constellation of satellites that will be sent to orbit around Earth. The satellites will harness the power of the Sun using solar panels and beam the energy back to Earth. Martin Soltau, the co-chairman at SEI told the BBC, "There's sufficient room in orbit for the solar power satellites, and the Sun's supply of energy is vast. A narrow strip around geostationary Earth orbit receives more than 100 times the amount of energy per year than all of humanity is forecast to use in 2050."

POWER BOOST

Artemis I's rocket is the most powerful space rocket ever built.

The Orion capsule in space.

FROM THE ARCHIVES

Christmas Day on the ISS (25 December 2011)

The Expedition 30 crew celebrate Christmas.

Astronauts have been celebrating Christmas on the International Space Station (ISS) since Expedition 1 blasted off in November 2000. On the first mission, Astronaut Bill Shepherd and Cosmonauts Yuri Gidzenko and Sergei Krikalev spent the festive period opening presents and talking to their families. Since then, there has been a continuous presence on the ISS with astronauts celebrating the holiday period every year.

Christmas on the ISS is more or less like it is on Earth – but with less gravity. Astronauts dress up, exchange gifts and even eat turkey and mashed potatoes. On Christmas Day 2011, the Expedition 30 crew posed for a group photo, complete with Christmas hats, a giant stocking and a tree. If Russian cosmonauts are aboard, Christmas is celebrated twice: 25 December and the Russian Orthodox Christmas on 7 January.

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DO IT!

Spacewatch

This month, two of the solar system's planets will be disappearing behind the Moon in what is called an occultation. On 8 December, Mars will hide behind the Moon at around 04:57 in the early morning. It will reappear about an hour later at 05:58.

There's also a chance to see shooting stars with the Geminid meteor shower peaking between 14–15 December. The meteors shine white, yellow, green, red and blue as they shoot through the sky, because of metals like sodium and calcium burning up in the atmosphere. You can spot the Geminid meteor shower near the bright star Castor in the constellation Gemini.

Finally, the winter solstice falls on 21 December. This is the shortest day of the year – and the longest night – and it marks the start of winter.

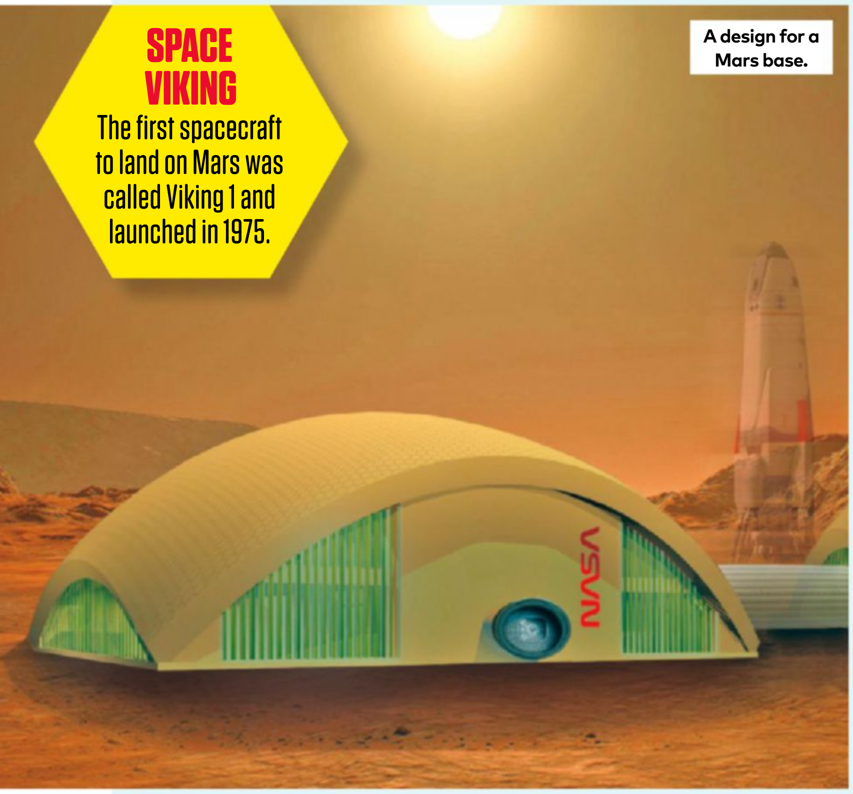
The solstice at Stonehenge.

The Christmas Tree Cluster, also called NGC 2264, is a cluster of newborn stars located in the constellation Monoceros.

A UNICORN IN THE SKY

The Monoceros constellation gets its name from the Latin word for unicorn.

Meet an astrobiologist



A design for a Mars base.

SPACE VIKING

The first spacecraft to land on Mars was called Viking 1 and launched in 1975.

LYNN ROTHSCHILD

THE NASA ASTROBIOLOGIST TALKED TO *SCIENCE+NATURE* ABOUT LIFE ON OTHER PLANETS AND MAKING MOON BASES OUT OF MUSHROOMS.

What first interested you in biology?
When I was eight years old we did a session with microscopes. One of the days, we looked at an amoeba (a single-celled microbe that can move) and that was it.

What do you do?
For the last 15 years, my job at NASA has been to lead a programme in synthetic biology. This means, I build things using biology on other planets.

Could we use living things to make a moon base?
There are a couple of companies now that are using fungal mycelium to build things. Underneath the surface of a mushroom is a network of hairlike structures called mycelium. We've taken the idea that you can put these mycelium with a binding material to make structures.

What advice would you give to budding scientists?
Take advantage of science programmes at museums. I remember a really cool project at the Science Museum where they had the kids draw small network patterns on paper with crayons. They had the kids melt the crayons and watch the water go through the channels. I thought this was the most fun thing that I've ever seen.

Coprophagia

From picnicking on poo to feasting on faeces, this is the stinky science of why animals eat dung.

Everyone poos, but some animals eat it, too. Disgusting, right? Well, in the animal world it is actually quite common. There's even a name for it: coprophagia (say cop-ro-fay-gee-ah). So, why do animals enjoy this sloppy snack?

A group of animals called lagomorphs, which includes hares, rabbits and pikas, eat a special type of droppings that they produce in their large intestines. When a lagomorph eats food, it can't digest all of the nutrients. Instead, it poos out pellets packed full of goodness, which it can then gobble back up again.

Capybaras, the world's largest rodents, do something similar. They excrete two types of poop: a hard one, which they leave alone, and a softer one, which they eat because it is protein-rich and full of useful bacteria (tiny organisms).

Your body is teeming with good bacteria that help you digest food. You get a dose of this bacteria when you are born, but how do animals get it? They eat their mothers' faeces (another name for poo), of course. Some baby mammals, such as hippos, koalas and elephants, devour the dung of their mothers or other adult members of the herd as they are graduating from milk to eating solid food.

It isn't just hungry herbivores that chow down on dung. Birds and insects lap up the stinky stuff, too. Egyptian vultures have bright yellow faces, which they use to attract mates. They get this yellow glow from their unusual diet – cowpats. Cow splat is rich in pigments called carotenoids (the same pigment that gives carrots their colour). When the vultures eat the dung, the carotenoids in the patties turn their faces yellow.

Hardworking dung beetles have one thing in common – they love eating, rolling and living in poo. When rolling a giant ball of poo, one type of dung beetle can push 1,141 times its own bodyweight – that's the same as an adult man pushing six full double-decker buses. Butterflies may be beautiful creatures, but they have a few disgusting habits. Some love nothing more than slurping up the salts and minerals from piles of animal plops. Yuck!

Thankfully, we humans get all the necessary nutrients from the food we eat, so we don't need to dine on dung for an extra top-up. Let's just leave the poo picnics to the animals.

ALAMY · REX SHUTTERSTOCK

Rabbits gobble up their own poo.

OLD HABITS

A scan of a 42,000-year-old baby mammoth showed that it had been eating adult faeces, most likely its own mother's.

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Trees brighten up the festive season.

Are real Xmas trees more eco-friendly?

Putting up a tree is a great festive tradition, but which tree is better for the environment?

When it comes to buying a Christmas tree, you have to choose what kind you want. On the one hand, you could go for an artificial tree, usually made of plastic, which will last you for many years to come. On the other hand, you could get a real Christmas tree, whose rich smell and bristling pine needles bring warmth and wonder to homes over the festive period, but which one is better for the environment?

Many people believe that real Christmas trees are worse for the environment than fake ones, because they involve cutting down a living fir or spruce. However, some research suggests that the negative effects of fake Christmas trees outweigh this. The process of creating artificial trees releases more carbon dioxide (the gas most responsible for climate change) than growing conifer trees does. Climate change is long-term changes in world weather patterns, including rising temperatures. Dr John Kazer, who works for the organisation Carbon Trust, showed that two thirds of the harmful gases released by producing fake trees are due to the fact that artificial trees are made of plastic. Shipping them long distances across the world – often from China – just adds to their carbon footprint (the total amount of carbon dioxide released into the atmosphere as a result of making them).

Producing and shipping a fake tree releases up to 10 times the amount of harmful gases as a real one, depending on how it is disposed of. Real trees, on the other hand, can be grown locally, minimising emissions. In the UK, 100 million trees are grown to be sold as Christmas trees. As they grow, they suck carbon out of the atmosphere. "Locally grown real trees are the best option if you can get one," said Mike Childs from the environmental group Friends of the Earth.

TREE-TASTIC GIFT

Oslo, in Norway, has given the UK a Christmas tree to put in Trafalgar Square, London, every year since 1947.

Fake trees are difficult to recycle. They are usually made of a type of plastic called polyvinyl chloride (PVC). Greenpeace, a group that campaigns to protect the environment, says that it is "the single most environmentally damaging" plastic.

However, the real Christmas tree industry also has downsides for the environment. Many people have argued that the vast amounts of Christmas trees planted in countries such as Norway harms biodiversity (the variety of animal and plant life.) Researchers have suggested that Christmas trees should be planted in "habitats with low importance for biodiversity" because of their impact on soil. They also take up a lot of land. People in the UK buy seven million trees each year. This takes up as much land as about 2,600 football pitches, which could be put to other, more eco-friendly, uses.

Unlike fake trees, which can be used again and again, real trees do not last forever. This means they have to be disposed of. While it is possible to dispose of fir trees in an environmentally-friendly way, many trees end up in landfill. Here, they release methane, a gas that is 25 times worse for the planet than carbon dioxide. Kristofer Covey, a scientist, says that although methane emissions from an individual tree are small, "at the global scale this could be huge."

Finally, chemicals such as pesticides are put on Christmas trees when they're growing, which can harm the health of the farmers growing them, and other animals that might make the tree their home.

But what do you think? Are real Christmas trees better for the planet than fake ones?

FOR

- Real Christmas trees are grown in nature. A lot of fake ones are made out of plastic, which can be bad for the environment.
- The process of producing and transporting artificial trees releases lots more harmful carbon dioxide gas than growing and shipping real trees.
- Artificial trees are very difficult to recycle because of the plastic they are made out of, which often releases harmful chemicals.
- Real trees absorb carbon dioxide from the atmosphere as they grow. If they weren't grown for people's Christmas trees, they wouldn't be there at all.

Living trees absorb carbon dioxide as they grow.

AGAINST

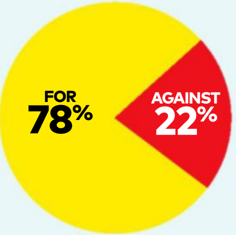
- Growing vast amounts of Christmas trees in countries like Norway has a harmful effect on the variety of plant and animal life (biodiversity).
- Growing fir and spruce takes up a lot of land, which could be used for growing food or left alone as wild woodland.
- When real trees are thrown into landfill, they release methane, which is 25 times more harmful for the environment than carbon dioxide.
- Living Christmas trees are sprayed with pesticides as they grow, which can be harmful to people, as well as to other animals and insects that live in the forest.

Fake trees can be used year after year.

LAST MONTH'S POLL

Last month we asked you if all plastic packaging should be banned. A majority of you thought we should ditch plastic.

THE RESULT



YOUR OPINION COUNTS

"Of course! There are so many other alternatives, and plastic is only going to be causing us more problems."
Summer22

"I don't think we need to ban plastic packaging as long as we can find a way to reuse it and handle it better."
Squirrel265

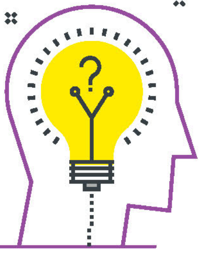
TELL US WHAT YOU THINK

Are real Christmas trees more eco-friendly? Vote **FOR** or **AGAINST** by visiting tinyurl.com/SN-vote or scan the QR code.

SCAN ME

GETTY IMAGES

HEADSCRATCHERS



Seeking answers to your science questions? Ask our resident expert, **Peter Gallivan**

Hi, I'm Pete, and I love science and the natural world. I work at the Royal Institution (Ri) in London, where I organise exciting, hands-on science events for young people. I've teamed up with *The Week Junior Science+Nature* to answer your burning science questions.

Ri The Royal Institution
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For more cool science, check out the Ri website rigb.org

How does your body know if it likes a specific food? *Alfie*

Your food preferences are due to both the environment you grew up in and your DNA (the complex chemical contained in your cells that carries the instructions for building, growing and running your body).

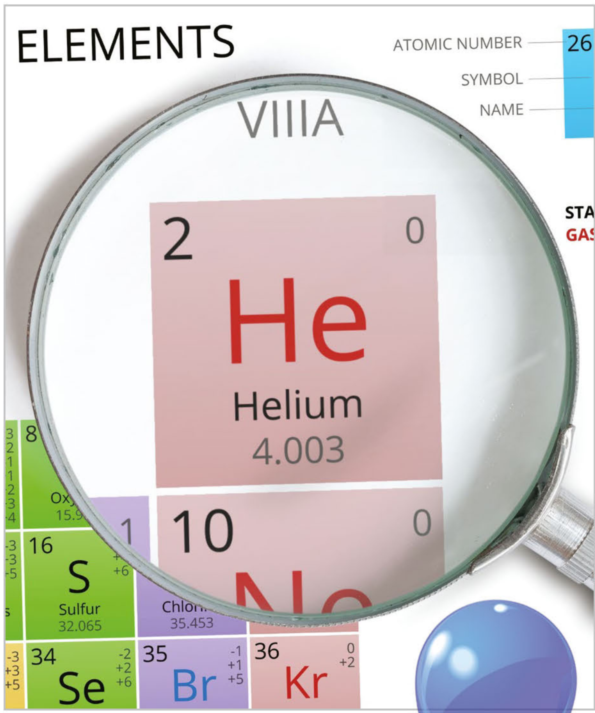
Liking sweet snacks and disliking sour things is hardwired into your DNA. This was inherited from your early ancestors, because sweet foods like fruits are usually full of energy, whereas sour foods may be poisonous. Some people are also "super-tasters", and from birth are more sensitive to sour foods. Super-tasters often dislike vegetables, as the bitter flavours in these foods taste too strong to them.

More specific preferences develop as you grow older. For certain foods, you learn to associate the flavour with the benefits it gives you. You might really like oranges, for example, because your brain associates the taste with the incoming rush of sugar.

You can also develop a liking for new nibbles because they are similar in taste to ones you already like. Your food preferences slowly change over time, and even change during your adulthood. However, traumatic experiences, such as vomiting after eating something, can put you off a particular food for life.

SWEET TREAT
A 2022 survey found that strawberries are the UK's favourite fruit.

Yum or yuck?



How do you make helium?

Zachariah

Helium is the second lightest element in the periodic table, and makes up 23% of the universe. It is, however, mostly found outside our planet, within stars. Earth's atmosphere is only about 0.0005% helium, so it must be found in other ways. Most of the helium that people use is made as a by-product of natural gas production. Underground reserves of gas typically contain around 3% of helium, but one recently found in Tanzania, in Africa, contained an impressive 10%.

Once this mix of gases is extracted from the ground, it is processed by heating and cooling under extreme pressures. This helps to separate the various gases from each other, and eventually produces pure helium. Helium is used for lots of different things, including as a coolant and for filling party balloons.

SEND IN YOUR QUESTIONS

Do you have a question that has got you scratching your head? Note it down and email it to us at *headscratchers@science-nature.co.uk* – remember to include your name.

REX SHUTTERSTOCK

Elephants are long-distance talkers.

What's the furthest music can travel? *Tommy*

When a sound is created, perhaps by a musical instrument, it causes particles of air to vibrate. These jostle and bump into nearby particles, causing a wave of vibrations that travels outwards through the air – a sound wave. Sounds can travel quite fast – up to 330 metres per second.

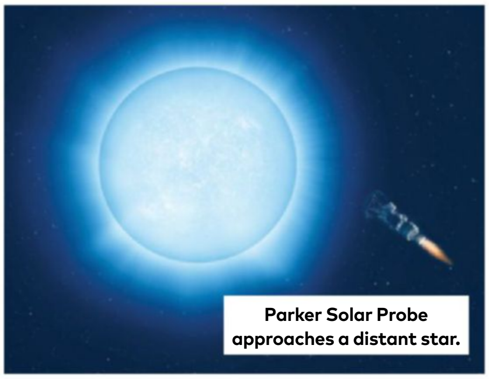
Sound waves lose energy as they spread out, so how far they can travel depends on how much energy they have at the beginning – basically how loud they are. The eruption of the Krakatoa volcano in 1883 is thought to be the loudest sound ever. It was heard almost 3,000 miles away. That's nearly the distance from London to New York.

Lower pitch sounds also travel further than higher sounds. Elephants can communicate up to six miles apart, with calls so low human ears can't hear them. On La Gomera, one of the Canary Islands, people sometimes use a low and loud whistling "language" to speak to each other from up to five miles away. Sound waves can travel even faster in water than in air – this helps the deep sounds made by whales to travel up to 10,000 miles.

How long would it take to get to Proxima Centauri travelling at the speed of sound? *Dr Shaun O'Connell*

Proxima Centauri is the nearest star to Earth, and is 25,000,000,000,000 miles away. On Earth, sound travels at around 761.2 mph. At this speed, it would take a spacecraft around 3.7 million years to reach Proxima Centauri.

The fastest spacecraft ever built – NASA's Parker Solar Probe – travels much faster. Launched in 2018, it hit a record speed of 364,660 mph. At this rate it would take a mere 7,800 years to reach Proxima Centauri – a much more sensible time. However, this is still only 0.05% the speed of light (670,616,629 mph). At this, the universe's theoretical top speed, it would take 4.24 years to reach the nearby star.



Parker Solar Probe approaches a distant star.

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SCIENCE WORLD

The best TV shows, films, events and books to look out for this Christmas and New Year.

WATCH IT

Christmas Lectures

Detectives can't solve crimes all on their own. Behind the sleuthing is a world of science, which helps uncover the truth and bring criminals to justice. This Christmas, step beyond the police tape and onto the scene of the crime to see if you can crack the case.

During the Royal Institution's Christmas Lectures, Professor Dame Sue Black will be revealing the secrets of forensic science. Forensics is the application of scientific methods to criminal investigations. Black is a forensic anthropologist, which means she helps governments identify the victims of various conflicts and natural disasters. Across a series of three lectures, Black will reveal the scientific methods that help her find hidden clues in the human body, and solve crimes from just a few bone fragments. She told *The Week Junior Science+Nature*, "I'm a huge fan of the Royal Institution Christmas Lectures and I have been since I was a little girl." The 2022 Christmas Lectures will be broadcast on BBC Four and iPlayer between Christmas and New Year.

FESTIVE TRADITION
The Christmas Lectures is the world's longest running science TV show.

Professor Dame Sue Black.

SHOW

Cosmic Christmas

It's Christmas Eve, and Santa has one last stop to make… the International Space Station. After all, astronauts need presents too. Cosmic Christmas is a live, 45-minute show at the Winchester Science Centre and Planetarium. As well as the show, tickets grant you entry to the Science Centre and a number of Space Station Science activities. To find out more, visit tinyurl.com/SN-cosmic

DOCUMENTARY

Good Night Oppy

Landing on Mars in 2004, the Opportunity rover (nicknamed "Oppy"), was meant to survey the Red Planet for 90 days. It ended up working for 15 years, making numerous discoveries before finally going offline after a dust storm in 2018. In this film on Amazon Prime Video, follow Oppy's groundbreaking journey and hear from the scientists who tracked its progress back on Earth.

GET INVOLVED

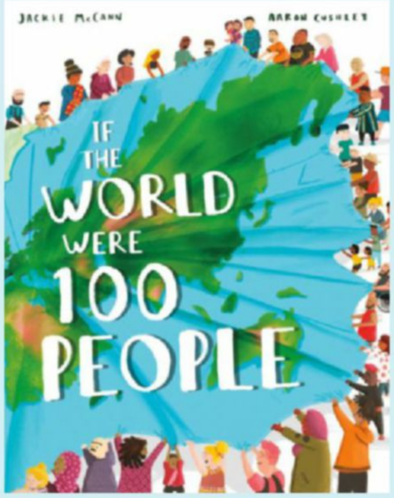
Santa Loves STEM

The Institution of Engineering and Technology (IET) has launched its annual Santa Loves STEM campaign. STEM stands for Science, Technology, Engineering and Mathematics. On the IET site is Santa's STEM workshop, which is packed full of Christmas-inspired science activities, challenges, projects and recipes for you to enjoy. To visit Santa's workshop, head to tinyurl.com/SN-stem

AMAZON STUDIOS · COURTESY INSTITUTION OF ENGINEERING AND TECHNOLOGY (IET) · COURTESY WINCHESTER SCIENCE CENTRE · PAUL WILKINSON PHOTOGRAPHY

BEST SCIENCE BOOKS

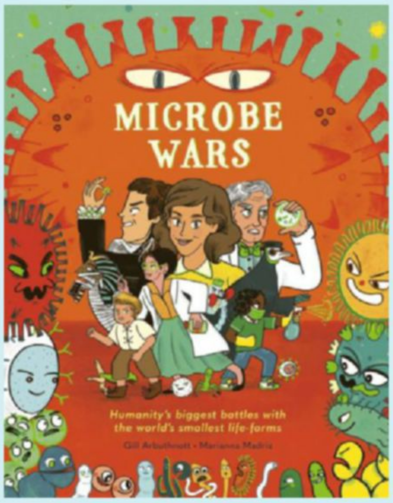
From ways to save the planet to fantastic women scientists, the brilliant books on this year's Young People's Book Prize shortlist aim to change the world.


JACKIE McCANN
AARON CUSHLEY
IF THE WORLD WERE 100 PEOPLE

If the World Were 100 People

By Jackie McCann
Illustrated by Aaron Cushley
Red Shed (out now)

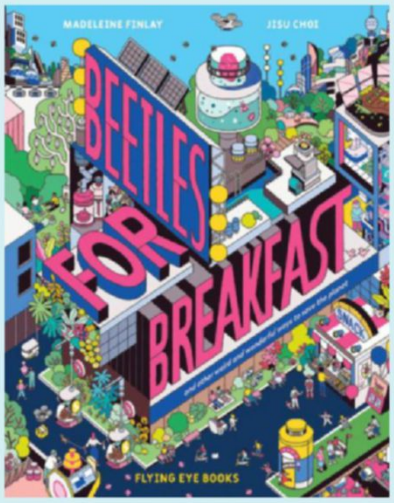
There are about eight billion people on Earth. However, it's hard to imagine that many people, so this book breaks down the world's population into 100 people, with each person representing about 80 million people in the real world. Find out how many people have black hair, how many grown-ups there are to children, and what languages they can speak.


MICROBE WARS
Humanity's biggest battles with the world's smallest life-forms
Gill Arbuthnott • Marianna Madriz

Microbe Wars

By Gill Arbuthnott
Illustrated by Marianna Madriz
Templar Publishing (out now)

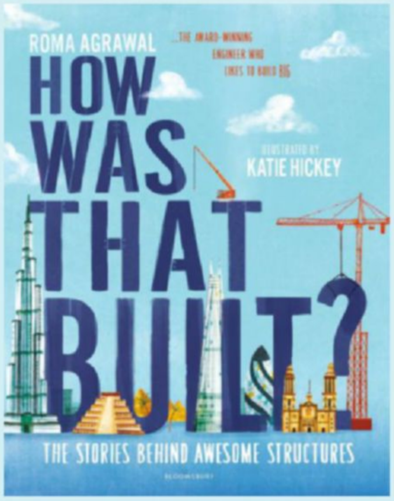
Every day, humans fight a battle with disease-causing microbes. Covid-19 is just the latest example of how bugs and germs can affect our lives and turn them upside down. However, scientists have fought back, with treatments and vaccines giving us valuable weapons to defend ourselves. In *Microbe Wars*, find out about the history of viruses and the scientists who rose up to tame them.


MADELEINE FINLAY
JISU CHOI
BEETLES FOR BREAKFAST
FLYING EYE BOOKS

Beetles for Breakfast... and Other Weird and Wonderful Ways to Save The Planet

By Madeleine Finlay
Illustrated by Jisu Choi
Flying Eye Books (out now)

Take a step into the future, and see how your daily life might change as scientists find new ways to save the environment. From eating beetle burgers to brushing your teeth with biodegradable algae, this book is full of fascinating facts and inventions to protect the planet.


ROMA AGRAWAL
HOW WAS THAT BUILT?
KATIE HICKEY
THE STORIES BEHIND AWESOME STRUCTURES

How Was That Built?

By Roma Agrawal
Illustrated by Katie Hickey
Bloomsbury Children's Books (out now)

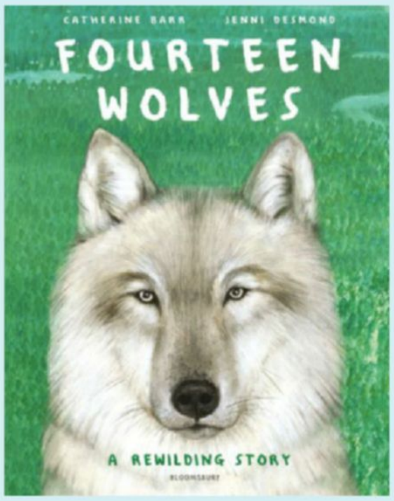
Have you ever looked at a skyscraper and wondered, how was that built? Then this is the book for you. Written by the structural engineer Roma Agrawal, who helped build the Shard skyscraper in London, this book takes you inside some super structures and the stories behind them. From the construction of the Brooklyn Bridge to building on the Moon, this book is perfect for budding engineers.

Kate Pankhurst
FANTASTICALLY GREAT WOMEN SCIENTISTS and their STORIES
BLOOMSBURY

Fantastically Great Women Scientists and Their Stories

By Kate Pankhurst
Bloomsbury Children's Books (out now)

Written by Kate Pankhurst, a descendant of the suffragette (someone who fought for women's right to vote) Emmeline Pankhurst, this book celebrates female scientists whose work has changed the world. Scientists featured include Mae Jemison, the first African-American woman to go to space, and the chemist Tu Youyou, who invented a drug for malaria.


CATHERINE BARR
JENNI DESMOND
FOURTEEN WOLVES
A REWILDING STORY

Fourteen Wolves

By Catherine Barr
Illustrated by Jenni Desmond
Bloomsbury Children's Books (out now)

With beautiful illustrations by Jenni Desmond, this book tells the incredible true story of how wolves were reintroduced to Yellowstone National Park in the US. Wolves went extinct in the park in the 1930s, causing the ecosystem to collapse. Bears starved, plants died and rabbit families shrunk. In 1995, 14 wolves were released in the park and they've helped in lots of unexpected ways.

Royal Society Young People's Book Prize 2022

WIN!

Every year, the Royal Society runs the Young People's Book Prize, with an aim to promote literacy in young people and inspire them to read more books about science. The shortlist for this year's prize has been released, with six fantastic books. The eventual winner will be announced in March 2023, but meanwhile we're giving away the entire shortlist – a bundle worth over £60 – for five lucky winners. For a chance to win go to sciencenature.theweekjunior.co.uk/books and fill in the form by 23:59 on 4 January 2023. Make sure you have a parent or guardian's permission.

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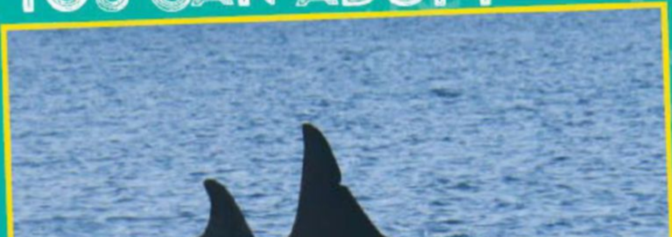
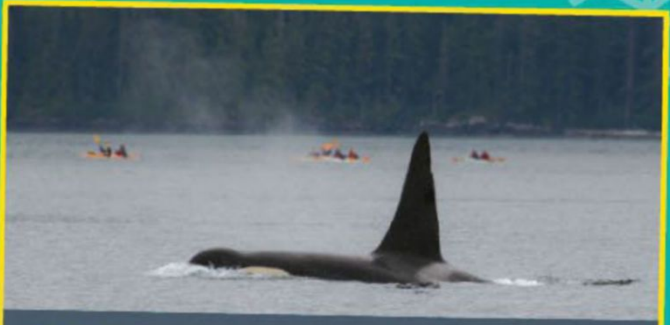


BEND

Bend was a surprise from the time she was born. No one had ever seen an orca quite like her. On the front edge of her dorsal fin was a deep cut and it grew lopsided taking on a comical look of the sorting hat from Harry Potter!

OR



FIFE

Fife is the younger brother of Corky. Tragically, he has never met his sister as she has been held in captivity by SeaWorld. He is quite a character and easy to recognise by his tall dorsal fin.

Order by 19 December 2022 for Christmas dispatch

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WARNING! Ask an adult for help with cooking on the hob.

THE LAB

Lots of things to make and do

FINGER-LICKIN' GOOD
The world chutney comes from the Hindi word *chatni*, meaning to lick.

Kitchen chemistry

Make Christmas chutney

This festive jam is perfect with pigs in blankets, or spread on cheese and biscuits.

What you need

- 1kg plums, finely chopped
- 3 onions, finely chopped
- 100g **dried cranberries or raisins**, roughly chopped
- 1 tbsp grated ginger
- 1 tbsp mustard seeds
- 1 tbsp ground cumin
- 1 tbsp paprika
- 400ml **red wine** vinegar
- 500g light Muscovado sugar
- 2 tsp salt

- Pan
- Wooden spoon
- Sterilised jars

Instructions

1 Add all the ingredients, apart from the sugar and salt, to a large pan. Put it on the hob and bring to a boil, stirring all the while. Then, pop the lid on the pan and simmer on a low heat for 10 minutes, or until the plums become tender.

2 Pour in the sugar, along with two teaspoons of salt, and stir well until it has all dissolved. Keep the pan on a low simmer, uncovered, for 20 to 30 minutes until it thickens, stirring occasionally to keep the mixture from burning.

3 Allow the chutney to cool, and then spoon it into jars. Seal them and leave to rest for at least two weeks before eating. The chutney will stay good for at least six months, so be sure to label the jars with the date (and what is in them).

Allergy warning! Ingredients in **bold** are allergens (substances that cause allergic reactions). Learn more at tinyurl.com/SN-allergy

Slowly simmer your plums first.

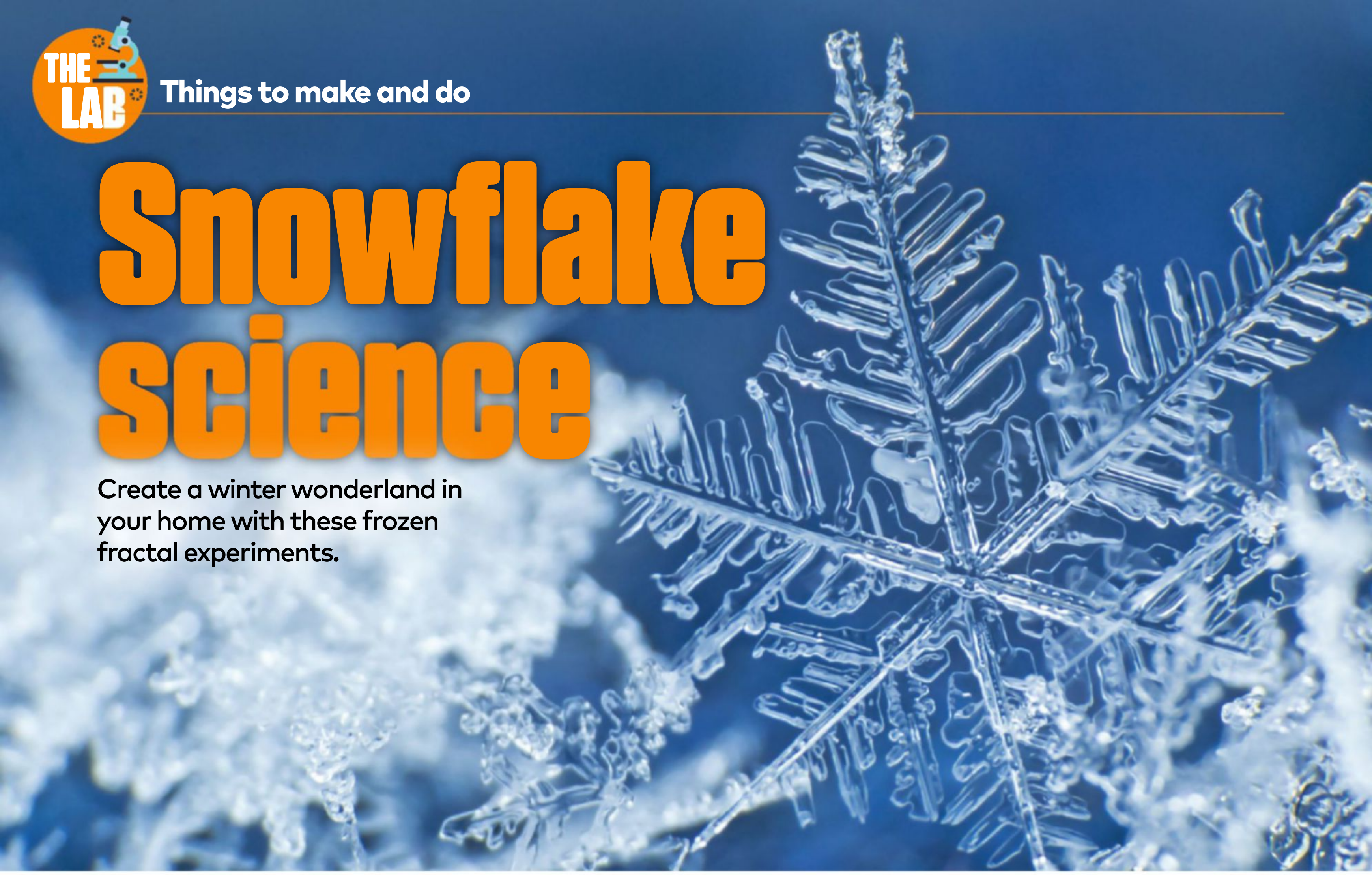
How does it work?

Boiling fruit releases a substance called pectin. Pectin is a kind of starch found in fruit, and when it is released from the skins and cores of fruit, it forms a thick, jelly-like material. This substance is called a gelling agent, and it's made up of tiny particles that link together to weave a web that locks up the juicy liquid and pieces of fruit in chutneys, jams and other preserves, like a sugary cement. Without it, your chutney would be a loose sticky mess. Adding sugar and an acid, like vinegar, helps the pectin particles bond together even better.

REX SHUTTERSTOCK

Snowflake science

Create a winter wonderland in your home with these frozen fractal experiments.



Catch a snowflake

Get outside and learn about the unique properties of snowflakes.

What you need

- Black piece of card
- Magnifying glass
- Warm gloves

1 Place your piece of black card outside, in a sheltered spot, for at least 10 minutes. It needs to be cold and dry to catch a snowflake.

2 When it snows, hold your piece of card flat to try and catch snowflakes. Study the ice crystals with a magnifying glass.

3 Shake off the card and try again. How many different shapes and patterns can you find?

How does it work?

A snowflake forms when a drop of water in the sky freezes around a tiny bit of dust – the seed of a snowflake. As the ice crystal falls, more water freezes around the original drop and so it grows. Water freezes in regular, repeated patterns, which is why all snowflakes are hexagonal.

GETTY IMAGES · REX SHUTTERSTOCK

Make a snow globe

These homemade Christmas toys would make a lovely present for family or friends.

What you need

- A clean, empty jar with lid
- Toys (you could use LEGO, or Christmas cracker gifts)
- Glue (we used a hot glue gun)
- Glycerin
- Water
- White biodegradable glitter
- Spoon

1 Glue your chosen toy the underside of the jar lid and wait until it to dries completely.

2 Fill the jar halfway with glycerin, then top it up (almost to the top) with water. Add a teaspoon of glitter at a time until you're happy with the amount of snow in the jar.

3 Screw the lid onto the jar, being careful not to spill out any of the liquid. Now, turn the jar upside down and shake it up. The glitter in your jar should flurry and swirl, just like a real snow storm.

How does it work?

The glitter in your snow globe falls slowly like snow because of the viscosity, or thickness, of the liquid in the jar. Viscosity is a word that describes how easily a liquid flows. Water, which flows easily, has a low viscosity, whereas liquids like honey or syrup don't flow easily and so have high viscosity. Glycerin thickens up the water to create the perfect viscosity for the glitter snowflakes to fall in the jar like snow in a snowstorm.

Craft geometric crystals

These funky science patterns look great on your Christmas tree.

What you need

- White paper
- Scissors

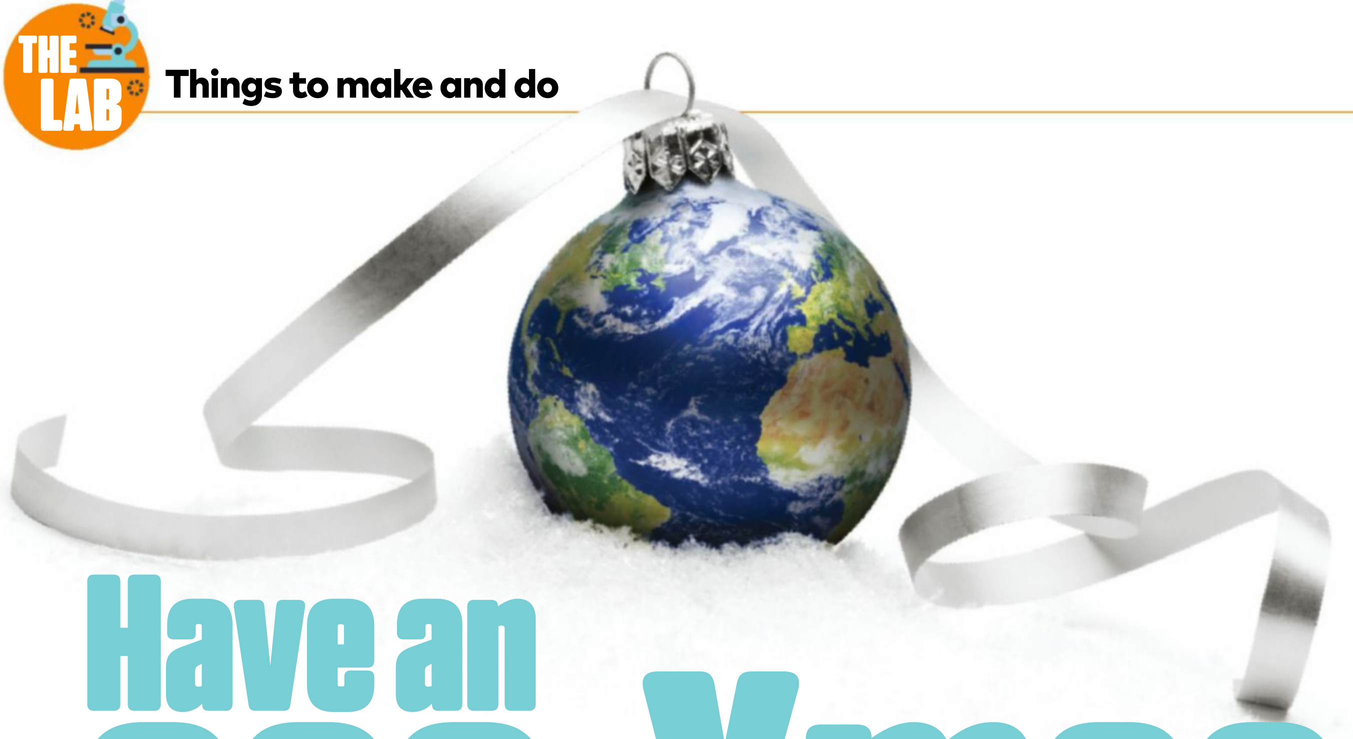
1 Use a plate as a template to draw a large circle in the middle of your white paper. Then, cut the circle out.

2 Next, fold the circle in half four times. You should have a shape that looks like a thin slice of pie.

3 Snip shapes and patterns into the folded paper. If you fancy cutting some science heroes into your snowflakes, head to fi.edu/snowflakes where you can download and print free templates of famous figures, such as Albert Einstein, Benjamin Franklin, Jane Goodall and many more.

How does it work?

Snipping random shapes into your snowflakes highlights just how unique these wonders of nature really are. Why are all snowflakes different? It's because each one experiences slightly different conditions as it falls through the air. Thin needle-like shapes tend to form in colder air. Less humid (wet) air forms flatter spines. This small difference in initial conditions creates an infinite variety of patterns.



Have an eco-Xmas

Help protect the planet over the festive period.

What you need

- Lard
- Bird seed
- Nuts
- Raisins
- Cheese (grated)
- Bowl
- Brown paper or a scarf
- Toilet roll tubes
- Coloured tissue paper
- Paper
- Pencil
- Bad jokes
- Small wooden toys
- Pie dish
- Shortcrust pastry
- Winter berries, holly, pine cones and leaves
- String of LED lights

How does it work?

In 2021, the average UK person spent around £1,100 during the Christmas period. This includes money spent on food, cards, wrapping paper, and decorations – much of which are thrown away. Shopping locally and reusing decorations can help you reduce your consumption this holiday, and help you have an eco-Christmas.

WIN!

The Week Junior is on a mission to encourage families to enjoy a more sustainable Christmas, so they have launched the Make It Christmas competition. To get involved, make something festive from old magazines or card, take a photo and upload it to theweekjunior.co.uk/makeitchristmas for a chance of winning prizes.

Make bird seed wreaths Mix together lard, bird seeds, nuts, raisins and grated cheese in a bowl. Mould the mix into doughnut shapes and leave to sit in the fridge until set. Tie some twine through the wreaths and hang them outside. Watch to see which birds arrive to enjoy them.

Rent a Christmas tree Around seven million Christmas trees are thrown away every year. These trees are important for winter wildlife and the planet. Instead of buying a real Christmas tree or using a fake one, your family could rent one. These trees come in special pots and are planted once you are finished.

Use eco-friendly wrapping paper Wrapping paper looks great on gifts, but a lot of the paper contains plastic, which is bad for the environment. Try wrapping presents in brown paper, jazzed up with winter leaves, berries and twigs. Or, use a scarf to wrap your present (the scarf can be an extra gift).

IT'S CRACKERS!

Every year, people in the UK pull around 154 million Christmas crackers. The plastic toys inside often get thrown away.

Give your Christmas an eco-makeover.

Make your own crackers Save toilet roll tubes from toilet rolls. Write jokes or draw pictures, and tuck them inside the tubes, along with a wooden toy. Wrap the tubes in coloured tissue paper. You can also buy cardboard cracker snaps to make them open with a bang. Decorate your dinner table with your crackers.

Cook a leftover Christmas pie A big dinner is one of the joys of Christmas Day, but there's always lots of leftovers. On Boxing Day, cover the bottom of a pie dish with some shortcrust pastry and fill it up with all your leftovers. Pop on a pastry lid, and brush with egg or oil. Put in the oven at 180°C for around 35 minutes.

Find natural table decorations Winter berries, sprigs of holly, leaves or pine cones found on a woodland walk will make your Christmas table look really festive. Weave in tinsel, baubles or a string of battery-powered LED lights, to make your decorations twinkle and shine.

ALAMY · GETTY IMAGES · REX SHUTTERSTOCK

Jazzy jumpers memory game

Test your powers of recall with a set of randomly generated Christmas jumpers.

What you will need:

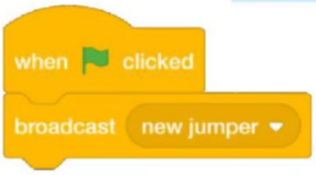
- A computer
- Scratch

How does it work?

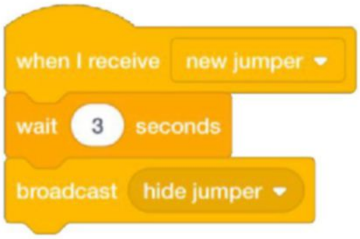
This project uses a free, online coding language called Scratch. By creating programmes using Scratch, you can improve your problem-solving skills. This activity teaches you how to broadcast messages and switch costumes.

Set the stage

Stage sprite



```
when 🏁 clicked
broadcast new jumper ▾
```



```
when I receive new jumper ▾
wait 3 seconds
broadcast hide jumper ▾
```

1 Go to jumpto.cc/jazzy-go to open the starter project in Scratch.

2 Select the stage sprite and build the script above. A script is a stack of coding blocks that makes a set of instructions. Drag the colour-coded blocks from the list on the left-hand side of the screen. Snap them together in the coding area in the middle, starting with the "green flag" hat block.

3 You will need to create a new message. To do this, select "new message" from the drop-down menu on the "broadcast" blocks. Input "new jumper" and "hide jumper" in the correct places.

4 Then, change the 1 second to 3 seconds on the "wait" block.

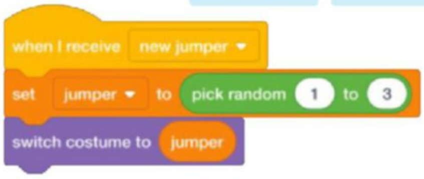
Make jumper patterns

Jumper sprite

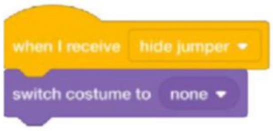
Stripes sprite

Pic sprite

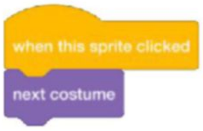
Trim sprite



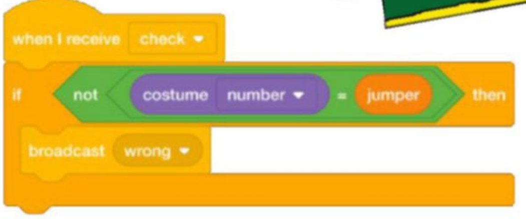
```
when I receive new jumper ▾
set jumper ▾ to pick random 1 to 3
switch costume to jumper
```



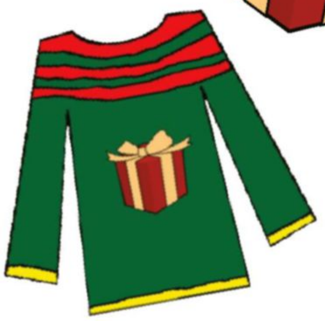
```
when I receive hide jumper ▾
switch costume to none ▾
```



```
when this sprite clicked
next costume
```



```
when I receive check ▾
if not costume number ▾ = jumper then
    broadcast wrong ▾
```



1 Now, add code to tell the sprites when to pick a new costume. Let's start with the jumper sprite.

2 Scroll down to the bottom of the list and click "Make a variable". Label the variable "jumper", making sure to select "for all sprites". Uncheck the tick box next to jumper.

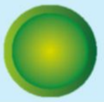
3 Build the script above. When selecting "When I receive" block, type "check". Then, on the "broadcast" block, input "wrong".

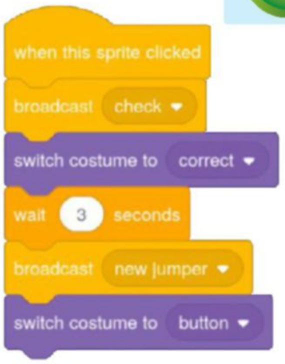
4 Build the same script for each of the other three pattern sprites – stripes, pic and trim. You will need to make a new variable for each of these sprites. Remember to uncheck the tick box on each variable. Put the new variables in place of the jumper variable in the coding blocks. Select the corresponding variable from the drop-down menu in the "set" block.

5 Click the green flag. A pattern should appear for 3 seconds.

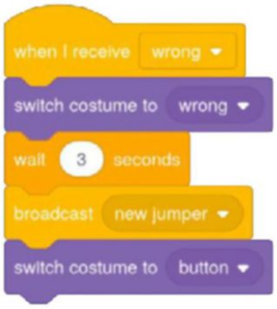
Test your memory

Button sprite





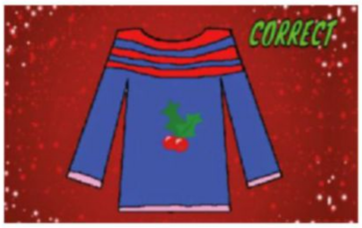
```
when this sprite clicked
broadcast check ▾
switch costume to correct ▾
wait 3 seconds
broadcast new jumper ▾
switch costume to button ▾
```



```
when I receive wrong ▾
switch costume to wrong ▾
wait 3 seconds
broadcast new jumper ▾
switch costume to button ▾
```

1 Select the button sprite and build the code above.

2 Click the green flag to play. Change the costume by clicking on each area of the jumper. Hit the green button to check your answer.



The Raspberry Pi Foundation is a UK-based educational charity working to put the power of computing and digital making into the hands of people all over the world. Discover more step-by-step coding projects at rpf.io/scienceandnature

Raspberry Pi Foundation

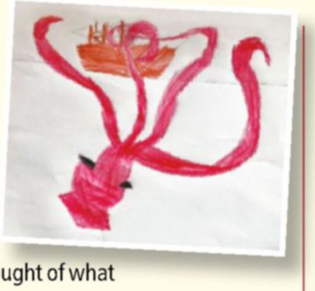
The Week Science+Nature HERO

Write in to win a Hero pin badge!

YOUR SPACE

Send in your photos and letters to *hello@science-nature.co.uk*
Every reader featured gets a *Science+Nature* Hero badge.

What a Kraken picture!



"Hi there! My name is Monty. I am obsessed with the Kraken and love listening to your Kraken podcast episode. I've listened to it about 10–20 times already! Here is my thought of what the Kraken looks like. I am always really hoping that the Kraken is real!"

A great picture, Monty! We loved recording that episode.

A ghostly treat

George was inspired by the baking activity in our Halloween special.

Your cooking is spook-tacular, George!

Mega machine

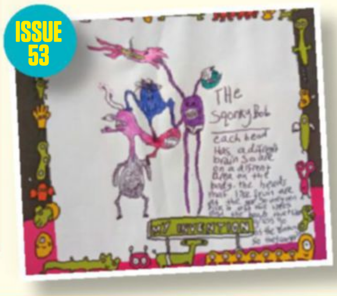
Georgia loved making the pinball machine from issue 54 of *Science+Nature*. She is very proud that it works!

ISSUE 54
SCORE

You're a pinball wizard, Georgia!

Out of this world alien design

Caleb won our Create an Alien competition from issue 53. Readers were challenged to imagine what an alien species might look like. The judges said that Caleb's "Sqonky Bob" alien was "a really original, creative design, which made us laugh and clearly had a lot of thought behind it."



Congratulations, Caleb!

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"Are the ghosts caught on camera real or just made by a computer?"

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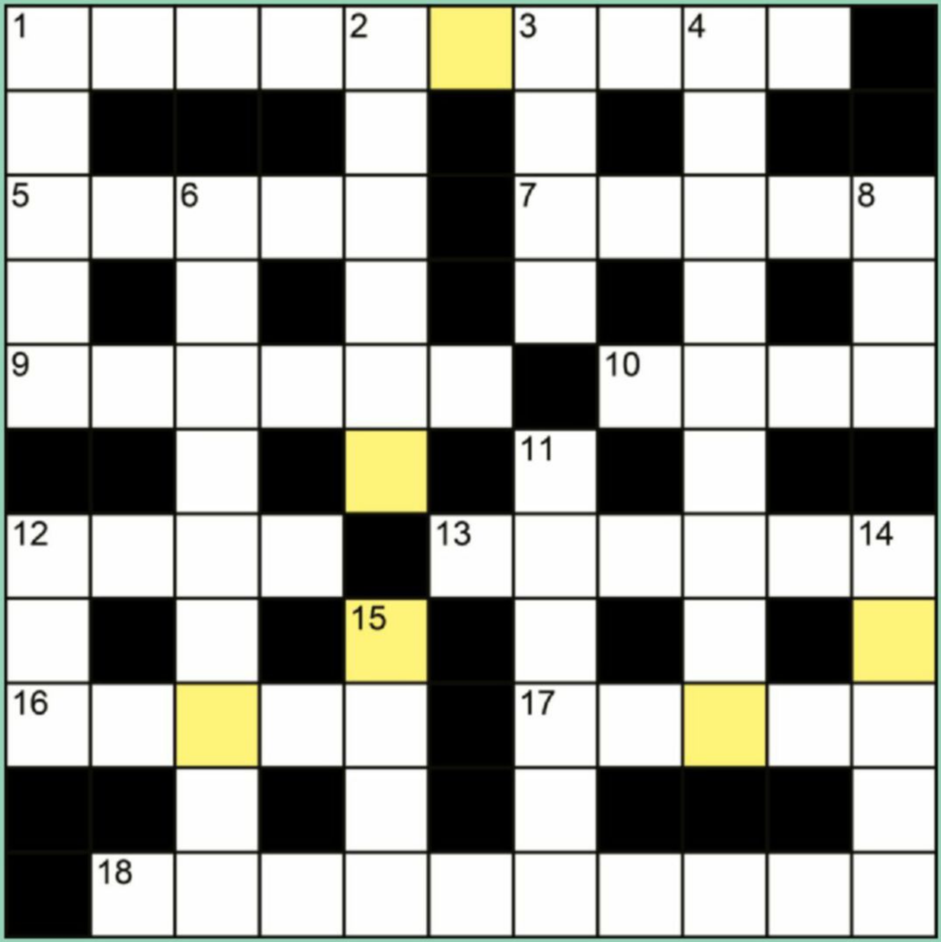
PUZZLES

CHECK YOUR ANSWERS ON PAGE 58

Secret Santa

Complete the crossword, then use the letters in the yellow boxes to find the hidden word.



ACROSS

1 British tennis player (4,6)
5 Takes it easy (5)
7 Distinct areas of a house (5)
9 Electronic messages (6)
10 Place smaller than a city (4)
12 Throb or hurt (4)
13 Law enforcers (6)
16 The name of a book or song (5)
17 Sporting stadium (5)
18 Instrument that makes things look bigger (10)

DOWN

1 Concur (5)
2 Mainly (6)
3 Uncommon (4)
4 Say sorry (9)
6 ___ bolognese: popular Italian food dish (9)
8 Male child (3)
11 Inhabitants of a particular place (6)
12 ___ and Dec: TV show presenters (3)
14 Rub out (5)
15 ___ Starmer: Labour Party leader (4)

Clue: You eat it at Christmas. ☐ ☐ ☐ ☐ ☐ ☐

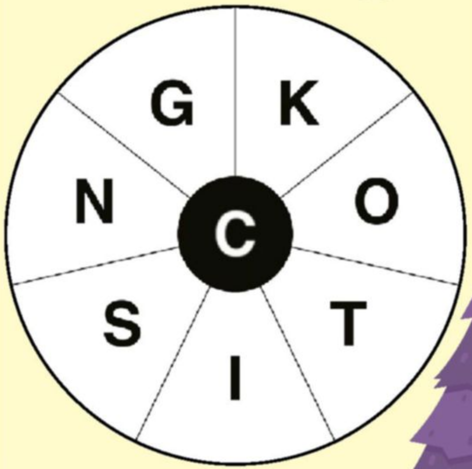
Number square

Fill in this grid so that the numbers 1–9 are each used once. Some are already in place.

	+	9	x		128
-	■	-	■	x	
1	+	5	+		9
+	■	÷	■	-	
	÷	2	+		7
12		2		20	

Christmas crackers

How many words of three letters or more can you make from the wheel, using the central letter each time? Can you find a word that uses all the letters?



Deck the halls

Shade in the numbers that are divisible by 9 to reveal an image.

17	69	56	40	92	34	32	32	63	36	81	43	83	51	98	11	4	49	3	88
15	22	13	57	27	81	27	27	45	49	36	36	54	81	36	36	44	98	75	30
53	12	54	36	90	34	63	64	90	54	18	39	45	53	39	90	99	63	20	82
26	81	99	34	43	32	45	99	81	81	45	36	18	49	46	52	45	99	42	25
29	45	9	54	63	61	9	45	90	44	72	72	81	13	72	74	54	45	54	65
81	54	47	27	81	37	96	81	45	63	45	72	51	92	11	45	27	68	9	90
45	75	63	64	27	72	90	45	36	73	9	18	9	72	72	63	8	31	33	18
63	99	68	4	72	90	47	54	81	55	72	45	70	22	54	27	10	81	67	9
9	99	90	22	45	26	10	18	27	71	27	27	39	7	46	9	71	41	90	45
90	27	54	9	9	56	32	44	81	86	72	20	49	13	73	36	77	45	36	36
90	67	27	27	9	58	12	73	29	5	78	42	37	17	42	90	27	90	81	54
36	15	95	45	81	54	51	98	88	58	57	50	69	39	9	72	9	81	88	54
81	38	45	4	27	63	6	31	66	80	64	49	41	7	45	18	73	83	75	90
90	8	87	93	81	90	89	6	52	85	47	77	23	6	9	90	28	72	17	90
45	18	49	81	24	27	1	50	26	40	5	37	2	81	45	15	87	57	36	45
27	9	15	20	1	36	9	90	87	63	72	13	72	72	61	11	27	61	81	81
14	72	99	18	99	63	79	90	27	99	54	72	9	72	72	19	82	9	9	11
84	93	45	90	54	18	3	8	26	45	36	91	31	81	63	99	36	99	66	57
66	78	87	90	54	97	79	54	86	90	18	67	66	85	45	99	9	30	82	5
21	1	70	11	36	45	36	72	27	99	72	99	90	90	90	27	73	98	97	82

Sumfinder

Three of the numbers in the box below add up to 53. But can you work out what those three numbers are?

24

14 35 32

31 20 36 19

37

39 13 22

Wintery words

Rearrange the scrambled letters to form words relating to Christmas:

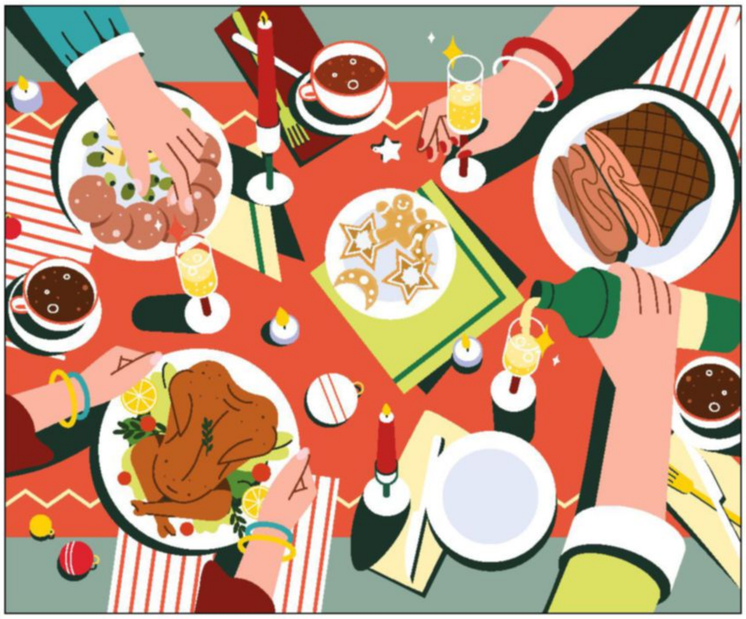
KNOW FLEAS =

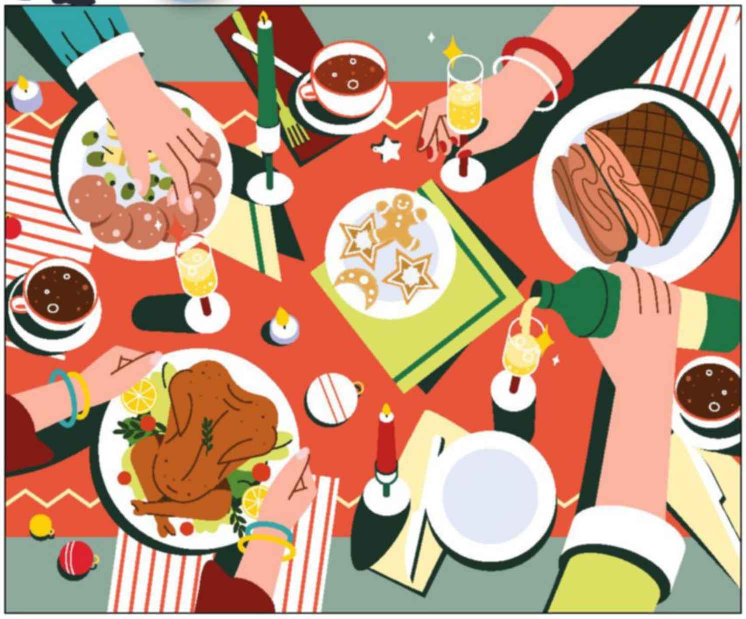
ICE HYMN =

ROAD SECTION =

Spot the difference

Can you spot the five differences between these two festive scenes?





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QUIZ

THICK HEAD
Pachycephalosaurus is the largest of the dome-skulled dinosaurs. Its name means "thick-headed lizard".

1 A dinosaur species might have behaved like which of the following fighty animals?

a) Koala bears
b) Kangaroos
c) Penguins

2 True or false? Scientists have given humans lab-grown blood.

3 What is the Earth's coldest continent?

4 Which ship does Beth Wilkinson work on?

a) RRS Queen Elizabeth II
b) RRS Sir David Attenborough
c) RRS Nick Chattenborough

5 True or false? Steve Backshall presented a TV show called *Deadly 50*.

6 What colour do mountain hares turn in the winter?

7 Which of these toys came out first?

a) Furby
b) Transformers
c) Scalextric

8 True or false? The Indian Army discovered Yeti-like footprints in 2019.

6

12

4

CHECK YOUR ANSWERS ON PAGE 58

10

3

9 Which car company makes the Spectre electric car?

10 Which space mission finally blasted off in November?

a) Artemis I
b) Saturn V
c) SpaceFlight 12

11 True or false? Some animals don't mind chewing their own poo.

12 Which country sends a Christmas Tree to the UK every year?

13 According to a 2022 survey, what is the UK's favourite fruit?

a) Apple
b) Banana
c) Strawberry

14 What is the world's longest running science TV show?

15 True or false? The Mars Opportunity rover was nicknamed Rovy.

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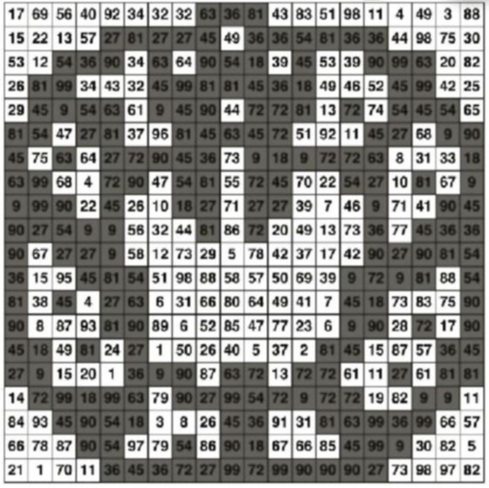
PUZZLE AND QUIZ ANSWERS

Secret Santa p54

A	N	D	Y	M	U	R	R	A	Y	
G				O		A		P		
R	E	S	T	S		R	O	O	M	S
E		P		T		E		L		O
E	M	A	I	L	S		T	O	W	N
		G		Y		L		G		
A	C	H	E		P	O	L	I	C	E
N		E		K		C		S		R
T	I	T	L	E		A	R	E	N	A
		T		I		L				S
	M	I	C	R	O	S	C	O	P	E

Keyword: turkey

Deck the halls p55



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15	22	13	57	27	81	27	27	45	49	36	36	54	81	36	36	44	98	75	30
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26	81	99	34	43	32	45	99	81	81	45	36	18	49	46	52	45	99	42	25
29	45	9	54	63	61	9	45	90	44	72	72	81	13	72	74	54	45	54	65
81	54	47	27	81	37	96	81	45	63	45	72	51	92	11	45	27	68	9	90
45	75	63	64	27	72	90	45	36	73	9	18	9	72	72	63	8	31	33	18
63	99	68	4	72	90	47	54	81	55	72	45	70	22	54	27	10	81	67	9
9	99	90	22	45	26	10	18	27	71	27	27	39	7	46	9	71	41	90	45
90	27	54	9	9	56	32	44	81	86	72	20	49	13	73	36	77	45	36	36
90	67	27	27	9	58	12	73	29	5	78	42	37	17	42	90	27	90	81	54
36	15	95	45	81	54	51	98	88	58	57	50	69	39	9	72	9	81	88	54
81	38	45	4	27	63	6	31	66	80	64	49	41	7	45	18	73	83	75	90
90	8	87	93	81	90	89	6	52	85	47	77	23	6	9	90	28	72	17	90
45	18	49	81	24	27	1	50	26	40	5	37	2	81	45	15	87	57	36	45
27	9	15	20	1	36	9	90	87	63	72	13	72	72	61	11	27	61	81	81
14	72	99	18	99	63	79	90	27	99	54	72	9	72	72	19	82	9	9	11
84	93	45	90	54	18	3	8	26	45	36	91	31	81	63	99	36	99	66	57
66	78	87	90	54	97	79	54	86	90	18	67	66	85	45	99	9	30	82	5
21	1	70	11	36	45	36	72	27	99	72	99	90	90	90	27	73	98	97	82

Number square p54

7	+	9	x	8	128
-		-		x	
1	+	5	+	3	9
+		÷		-	
6	÷	2	+	4	7
12		2		20	

Christmas crackers p54

Words that can be made from the wheel include: cog, cogs, coin, coins, con, cons, cost, costing, cot, cots, gnostic, icon, icons, nick, nicks, sic, sick, snick, sock, sonic, stick, stock, stoic, tic, tick, ticks, tonic, tonics

The word that uses all the letters: stocking

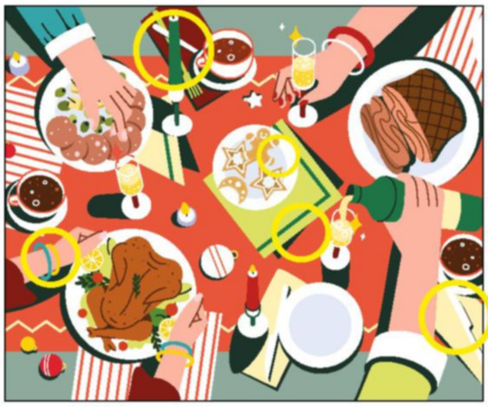
Wintery words p55

Snowflake, chimney, decorations

Sumfinder p55

14, 19, 20.

Spot the difference p55



What we learned

A type of tiny gecko, about the size of a paperclip, has made a remarkable comeback on Union Island in the Caribbean. In 2018, the population stood at just 10,000 geckos but after efforts to stop people stealing them, their numbers have grown to around 18,000 today.

A Union Island gecko.

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Quiz answers p57

1 b) Kangaroos **2** True **3** Antarctica **4** b) RRS Sir David Attenborough **5** False, it was *Deadly 60* **6** White **7** c) Scalextric **8** True **9** Rolls-Royce **10** a) Artemis I **11** True **12** Norway **13** c) Strawberry **14** The Royal Institution's Christmas Lectures **15** False, it was nicknamed Oppy

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Features editor: Michael Dalton
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Senior sub-editor: Bushra Ali Khan

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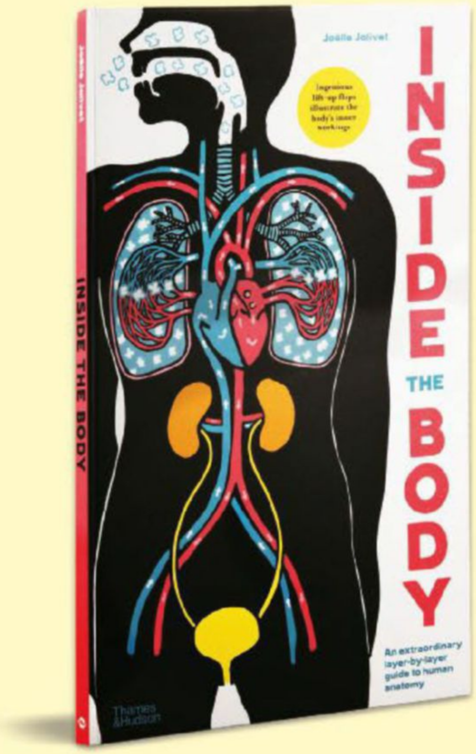
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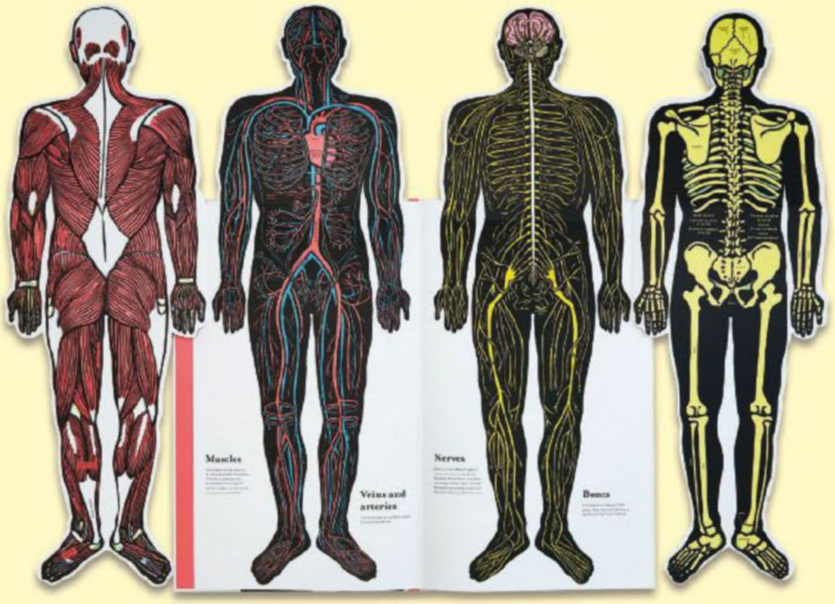
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